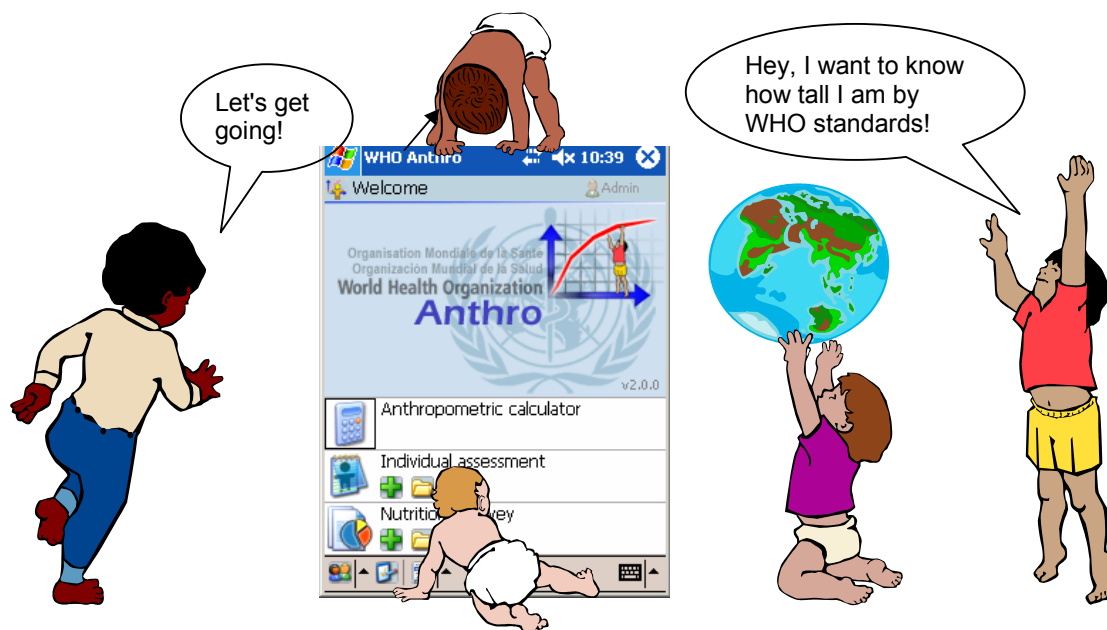


# WHO Anthro for Mobile Devices Manual



**Software for assessing  
growth and development of  
the world's children**



**World Health  
Organization**



© World Health Organization 2007.  
All rights reserved.

## **WHO Anthro software license agreement:**

### **On the use of the WHO Anthro for mobile devices version 2. Software for assessing growth and development of the world's children**

This End User License Agreement accompanies the WHO Anthro software for PocketPC and Windows Mobile and all related documentation. It refers to this current software version and any upgrades or modified versions of it licensed by WHO. Please read this Agreement carefully before starting the installation. By installing this software you (the User) accept all the terms and conditions of this Agreement.

The software and all related documentation are and shall at all times remain the intellectual property of the World Health Organization. Nothing contained in this Agreement shall be deemed to convey to the User any title or ownership in the software or the related documentation. The software is being made available by WHO for use in its present form for the application of the WHO Child Growth Standards. With an identification of the source WHO Anthro may be freely distributed and copied in whole, but not in part nor for sale or for use in conjunction with any commercial or promotional purpose.

The software includes the following system components Microsoft .NET 2.0 Compact Framework and Microsoft SQL Server 2005 Compact Edition.

The User is not permitted to modify, adapt, translate, reverse-engineer, decompile, disassemble, or otherwise attempt to discover the source code of the software, without prior permission from WHO. In addition, the User is not permitted to use any part of the contents of the software to develop a product that is to be sold or licensed for a fee. Users interested in developing any derived products are asked to contact: Department of Nutrition, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (fax: +41 22 791 4156).

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this software. However, the software is being distributed without warranty of any kind, either express or implied. The responsibility for the use of the software lies with the User. In no event shall the World Health Organization be liable for damages arising from its use.

### **Suggested citation**

Any mention of the software in published reports should include the following citation of the source: WHO Anthro for mobile devices version 2, 2007: Software for assessing growth and development of the world's children. Geneva: WHO, 2007 (<http://www.who.int/childgrowth/software/en/> ).



# **WHO Anthro for Mobile Devices**

Software for assessing growth  
and development of the world's children

Designed and developed by

Monika Blössner  
Amani Siyam  
Elaine Borghi  
Mercedes de Onis  
Adelheid Onyango  
Hong Yang

Department of Nutrition  
for Health and Development, Geneva, Switzerland

Jørn Klungsøyr  
Centre for International Health, University of Bergen, Norway

Simon Goumaz and Luc Dobler  
blue-infinity, sa, Geneva, Switzerland



**World Health  
Organization**

**Department of Nutrition for  
Health and Development**

**D  
H**



## Acknowledgments

The software was updated with the support of blue-infinity (b-i) sa, Geneva, Switzerland. We want to acknowledge the good work conducted by the b-i team, including Arris Han, Christophe Knuchel and Stéphane Huck.

We are extremely grateful to the many individuals who helped test the new version and provided valuable feedback, in particular: Dr Jürgen Erhardt (SEAMEO TROPMED, Jakarta, Indonesia), Mr Amir Moez Naïmi (IT consultant, ServiceGeneva, Switzerland), and our colleagues at WHO, UNICEF and SCN.

The guidance and continual solid support rendered by Mr Patrick Briand and Mrs Liliana Pievaroli (WHO/AME) are greatly acknowledged.

For the French and Spanish language labels we received generous assistance from, respectively, Chantal Gegout and Mari Carmen Celaya.

The development of this software was financed by a grant from the Bill and Melinda Gates Foundation to the Department of Nutrition.



# Table of contents

WHO Anthro software license agreement:	i
Acknowledgments	iii
Table of contents	iv
Abbreviations	vii
What is WHO Anthro for mobile devices	viii
Organization of this manual	ix
Typographic conventions	ix
1. The WHO Child Growth Standards	1
1.1 Background and innovative aspects	1
1.2 Technical details on attained growth indicators	1
1.3 Standard growth measurement procedures	2
1.4 Motor development milestones	3
2. WHO Anthro setup	3
2.1 Requirements	3
2.2 Installation	4
2.2.1 About previously installed version 1	4
2.2.2 Installing and running the mobile application	4
2.2.2.1 Troubleshooting	4
2.2.3 Reinstallation of version 2.0	5
2.3 Software removal	6
2.4 MD settings and data storage	7
2.4.1 Security issues	7
2.4.2 Change of language and regional settings	7
2.4.3 Data storage – warning symbol	7
2.4.4 System backup	8
2.4.5 Date synchronization and settings	8
3. Basic software functions	9
3.1 Icons and navigation	9
3.1.1 Close button	9
3.1.2 "Wait" cursor	10
3.1.3 Navigating lists	10
3.1.4 Changing column widths	10
3.2 Data input	10
3.2.1 Text input	10
3.2.2 Numeric input	11
3.2.3 Date input	12
3.2.3.1 Keyboard	12
3.2.3.2 Calendar	12
3.3 Data collection, calculations and display	13
3.3.1 Age	13
3.3.2 Oedema	13
3.3.3 Anthropometric data	14
3.3.4 Motor development	15
3.3.5 Results	15
3.3.6 BMI	15
3.3.7 Percentiles and z-scores	15
3.3.8 Graphs	16
3.3.9 Note on z-score/percentile calculations	17
3.3.10 Use of length and height in WHO standards	17
3.4 Data variables and codes	18
3.4.1 Description of standard variables	18
3.4.2 Data codes	18
3.4.2.1 Flags and error tracking	18
3.4.2.2 Motor milestone codes	19



3.4.2.3	Codes for Follow-up -> Interval .....	20
3.4.2.4	Codes for Follow up -> Referred to .....	20
3.4.2.5	Export of additional data .....	20
3.4.2.6	Date format and decimal separator .....	20
4.	Start-up and introduction to first windows .....	21
4.1	Login window .....	21
4.1.1	First time login .....	21
4.2	Welcome or main window .....	22
4.2.1	Access modules .....	22
4.3	Manage users windows .....	23
4.3.1	User properties .....	23
4.3.2	Management of users .....	23
4.4	Settings window .....	23
4.5	Toolbar menu .....	24
5.	<i>Anthropometric calculator (AC)</i> .....	25
5.1	Data-entry window .....	25
5.2	Results .....	26
5.3	Graphs .....	26
6.	<i>Individual assessment (IA)</i> .....	27
6.1	List of children window .....	27
6.1.1	Search function .....	27
6.1.2	Toolbar menu .....	28
6.1.3	Archive function .....	28
6.2	Child window .....	29
6.2.1	ID numbers .....	29
6.2.2	Parents, address .....	30
6.2.3	Follow-up .....	30
6.2.4	Notes .....	31
6.3	List of visits window .....	31
6.4	Visit windows .....	31
6.4.1	Anthropometry .....	32
6.4.2	Results .....	33
6.4.3	Graphs .....	33
6.4.4	Other data .....	34
6.4.5	Motor .....	34
6.4.5.1	Motor milestone status and colours .....	35
6.4.5.2	Motor milestones overview and graph .....	35
7.	<i>Nutritional survey (NS)</i> .....	36
7.1	List of surveys window .....	36
7.2	New survey .....	37
7.2.1	ID assignment .....	37
7.2.2	List of records .....	38
7.2.3	Search for child record .....	38
7.2.4	Child record .....	38
7.2.4.1	Reference .....	39
7.2.4.2	Anthro .....	39
7.2.4.3	Other Data .....	39
7.2.4.4	Motor .....	39
7.3	Spinning bottle .....	40
8.	Other functions .....	40
8.1	Import from file and Export to file .....	40
8.1.1	Import .....	41
8.1.2	Export .....	41
8.2	Copying and moving data .....	42
8.2.1	Copy using ActiveSync file synchronization .....	42
8.2.2	Copy using Windows Explorer on the PC .....	43
8.2.3	Copy using a memory card .....	43



8.2.4	Move files on the mobile device and memory cards .....	43
8.3	Manage additional data .....	44
8.4	Address Data .....	46
8.4.1.1	Country list .....	46
8.4.1.2	SALB data .....	46
8.4.1.3	Removing SALB data .....	47
8.4.1.4	State, province and district lists .....	47
8.4.2	Child address .....	48
8.5	Online help .....	48
8.6	About .....	48
8.7	Error log and error reporting .....	49
9.	Step by step examples .....	50
9.1	Individual assessment module .....	50
9.1.1	Anthropometric measurements .....	50
9.1.1.1	Child information .....	50
9.1.1.2	Visit 1 .....	50
9.1.1.3	Visits 2 - 8 .....	51
9.1.1.4	Graphic display of visits .....	51
9.1.2	Motor development .....	52
9.1.2.1	Motor milestones assessment: Jane Smith .....	52
9.1.2.2	Resetting a motor milestone .....	53
9.1.2.3	Motor milestones assessment for a new child .....	54
9.1.3	Define additional data .....	56
9.1.4	Collect additional data .....	57
9.2	Nutritional survey .....	57
9.2.1	Anthropometric and motor milestones assessment .....	57
9.2.2	Archive and export NS data .....	59
10.	Troubleshooting .....	61
11.	References .....	60
	Annex 1: IA and NS file schema .....	62



## Abbreviations

The following abbreviations are used in this manual:

AC	Anthropometric calculator module
BAP	BMI-for-age percentile
BAZ	BMI-for-age z-score
BMI	Body mass index (weight in kg divided by height in metres squared)
DoB	Date of birth
DoV	Date of visit
FAO	United Nations Food and Agricultural Organization of the United Nations
HAP	Length or height-for-age percentile
HAZ	Length or height-for-age z-score
HC	Head circumference
HCP	Head circumference-for-age percentile
HCZ	Head circumference-for-age z-score
IA	Individual assessment module
ID	Identification number
MD	Mobile device
MGRS	WHO Multicentre Growth Reference Study
MM	Motor milestones
MS	Microsoft
MUAC	Mid-upper arm circumference
MUACP	Mid-upper arm circumference-for-age percentile
MUACZ	Mid-upper arm circumference-for-age z-score
NA	Not available
NCHS	National Center for Health Statistics
NS	Nutritional survey module
OS	Operating system
PC	Personal computer
PDA	Personal digital assistant
PPC	PocketPC / Mobile device
SALB	Second Administrative Level Boundaries
SD	Standard deviation
SSF	Subscapular skinfold
SSFP	Subscapular skinfold-for-age percentile
SSFZ	Subscapular skinfold-for-age z-score
TSF	Triceps skinfold
TSFP	Triceps skinfold-for-age percentile
TSFZ	Triceps skinfold-for-age z-score
WAP	Weight-for-age percentile
WAZ	Weight-for-age z-score
WHO	World Health Organization
WHP	Weight-for-height percentile
WHZ	Weight-for-length and weight-for-height z-score





## What is WHO Anthro for mobile devices

WHO Anthro version 2 for mobile devices, hereafter referred to as WHO Anthro, is a software for use on mobile devices running MS PocketPC 2003 or MS Windows Mobile 5.0. It was developed to facilitate application of the WHO Child Growth Standards in monitoring growth and motor development in individuals and populations of children up to 5 years of age.

Version 1 of this software was published in 2006 together with the first set of the WHO Child Growth Standards (i.e. weight-for-age, height-for-age, weight-for-height, BMI-for-age and windows of achievement for six gross motor milestones).

In 2007 WHO published the second set of standards for the indicators head-circumference-for-age, arm-circumference-for-age, triceps and subscapular skinfold-for-age, triggering the need to update the software. This provided the opportunity to further enhance the software, include French and Spanish language versions as well as an online help facility.

This software consists of three modules:

- *Anthropometric calculator (AC)*
- *Individual assessment (IA)*
- *Nutritional survey (NS)*

Each module facilitates specific functions, i.e. to assess a child's nutritional status, follow a child's development and growth over time, or conduct nutritional surveys, respectively.

This manual provides an overview of the WHO Child Growth Standards including the motor development milestones, and instructions on how to apply them with the software. It further includes guidance on software installation and management, navigation through the fields, entering data and deriving results. It is assumed that the user has read the manual of his/her particular mobile device and is acquainted with its common usage.

WHO Anthro for mobile devices (MDs) mirrors the functionalities of WHO Anthro for PC, the sister software that has been developed for desktop computers running MS Windows 2000 or newer. WHO Anthro for MDs is also MS Windows-based, and data can easily be exchanged between the two platforms. Both softwares use common command icons, enable the user to execute similar functions, and allow importing data from and exporting data to most compatible file formats.

The WHO Anthro software for PC and MD, their manuals can be downloaded from [www.who.int/childgrowth/software](http://www.who.int/childgrowth/software).

For more information, please contact:

WHO Anthro  
Department of Nutrition  
World Health Organization  
Avenue Appia 20  
1211 Geneva 27  
Switzerland

fax: +44 22 791 4156

Or go to web site [www.who.int/childgrowth](http://www.who.int/childgrowth)



## Organization of this manual

The first section of this manual provides background information and presents the application of the essential software components, the WHO child growth standards including the gross motor development milestones.



The subsequent parts describe the software setup, provide information on installation and basic functions (common in all modules) and an introduction to its windows.

Separate sections describe the three different modules: *Anthropometric calculator*, *Individual assessment* and *Nutritional survey*.

Specific functions are summarized in the subsequent chapter followed by step-by-step examples that explain in detail how to operate the software. The annex presents the detailed schema for the file formats in the *Individual assessment* and *Nutritional survey* modules.

## Typographic conventions

This manual uses the following typographic conventions:

Item	Example/description
Interface buttons with text	Tap <Search>
Interface icon	Tap  (same as <Add>)
Keyboard keys	Press <Ctrl + Alt + Delete>
Menu paths	Tap < → File → Open>
Interface fields/items (labels, boxes etc.)	<i>Name</i>
User input	Type [Jane] in the <i>Name</i> field
System menu paths	Tap <  Start → Programs>
Tap and hold stylus	<↓>
Interface windows	<i>Main</i>

Whenever the manual refers to titles or names which appear on the software interface, these appear in italics.

Important notes to users appear grey-shaded, as shown here, to be distinguished from the running text.



# 1. The WHO Child Growth Standards

## 1.1 Background and innovative aspects

In 1990 the WHO constituted a Working Group on Infant Growth to develop recommendations for appropriate uses and interpretation of anthropometry in infants and young children. The Working Group's report (WHO, 1994) led to the conclusion that the National Center for Health Statistics (NCHS)/WHO international reference was flawed and failed to depict physiologic growth adequately. Its scientific weaknesses were sufficient to interfere with the sound nutritional management of young children, and the Working Group concluded that new growth curves were needed.

Consequently the WHO Multicentre Growth Reference Study (MGRS) was implemented to provide data to construct growth curves from birth to 5 years of age (de Onis et al., 2004). A key characteristic of the new standard is that it makes breastfeeding the biological "norm" and establishes the breastfed infant as the normative growth model. Health policies and public support for breastfeeding should be strengthened by having breastfed infants as the reference for normal growth and development.

The pooled sample from the six countries (Brazil, Ghana, India, Norway, Oman and the USA) that participated in the MGRS allowed the development of a truly international standard, reiterating the fact that children grow similarly when their health and care needs are met.

The wealth of data collected allowed the replacement of the international NCHS/WHO references on attained growth (weight-for-age, length/height-for-age, and weight-for-length/height) and the development of new standards for body mass index (BMI)-for-age, head circumference-for-age, arm circumference-for-age, triceps skinfold -for-age and subscapular skinfold-for-age. In addition, the development of accompanying windows of achievement for six gross motor development milestones provides a unique link between a child's physical growth and motor development.

Detailed descriptions of how the MGRS was implemented and the WHO Child Growth Standards constructed are available elsewhere (de Onis et al., 2004; de Onis et al., 2006, WHO, 2006; WHO, 2007).

## 1.2 Technical details on attained growth indicators

The first set of attained growth standards comprises the indicators weight-for-age, length/height-for-age, weight-for-length, weight-for-height and BMI-for age and the second set the indicators head circumference-for-age, arm circumference-for-age, triceps skinfold-for-age and subscapular skinfold-for-age. The same sample and methodology was used to derive both sets of standards.

For all indicators there are separate tables and charts for boys and girls using the z-score and percentile classification system.

The standards' ranges for each indicator are:

Indicators	Ranges
Weight-for-length	45 to 110 cm
Weight-for-height	65 to 120 cm
Weight-for-age	0-60 completed months
Length/height-for-age	
BMI-for-age	
Head circumference-for-age	
Arm circumference-for-age	3 to 60 completed months
Triceps skinfold-for-age	
Subscapular skinfold-for-age	

For all standards involving length or height measurements, recumbent length should be used for children younger than 24 months and standing height, for children 24 months and older. The software provides a mandatory box to tick, alongside the child's length or height data, to specify whether the



measurement was taken in recumbent or standing position. The software will automatically convert height to length for a child younger than 24 months whose height has been measured instead of length, and length to height for a child aged 24 months or older whose length was measured instead of height.

If age is not known but the type of measurement — i.e. standing (height) or recumbent (length) is provided — then the software uses that information to derive the results. If survey data have records with age unknown and no information on the type of measurement, then the software will assume that the measurement was recumbent length if the value is below 87 cm, or otherwise standing height. The cut-off point of 87 cm reflects the standards' median for boys and girls height-for-age z-score (HAZ) at 24 months. The WHO standards' median height is 87.1 cm for boys and 85.7 cm for girls, and median length is 87.8 cm for boys and 86.4 cm for girls. The mean of these four values is 86.75 cm which was rounded to 87 cm in order to obtain the cut-off point for shifting from length to height in case age and the type of measurement are unknown.

The standards' data tables for all age-based indicators are in days, and in 0.1 cm for weight-for-length/height. The tables and charts of the WHO Child Growth Standards are accessible in electronic format at [www.who.int/childgrowth/standards/en](http://www.who.int/childgrowth/standards/en). A full description of the technical aspects of the standards can be found elsewhere (de Onis et al., 2006; WHO, 2006; WHO, 2007).

### 1.3 Standard growth measurement procedures

Before applying the WHO growth standards and in order to collect reliable data users should follow standardized measurement procedures. Detailed measuring protocols can be found in:

1) Annex 2 of Physical status: the use and interpretation of anthropometry. Expert Committee Report. WHO Technical Report Series No. 854. Geneva: World Health Organization, 1995 (see [http://whqlibdoc.who.int/trs/WHO\\_TRS\\_854\\_\(annexes\).pdf](http://whqlibdoc.who.int/trs/WHO_TRS_854_(annexes).pdf)).

2) de Onis M, Onyango AW, Van den Broeck J, Chumlea WC, Martorell R for the WHO Multicentre Growth Reference Study Group. Measurement and standardization protocols for anthropometry used in the construction of a new international growth reference. Food and Nutrition Bulletin 2004;25(Supplement1):S27-36 (see <http://www.who.int/childgrowth/mgrs/en>).

3) World Health Organization. Training Course on Child Growth Assessment (<http://www.who.int/childgrowth/training/en>).

Among the most important points to ensure the collection of accurate anthropometric data are:

- Make sure all equipment is correctly calibrated on a regular basis.
- Conduct training based on recommended measurement protocols as well as standardization sessions for those who collect the data.
- Take the child's date of birth from a written record if available. Otherwise ask for both the child's date of birth and age on the day measured, since the year of birth is frequently reported incorrectly. If birth dates are not recorded or known with certainty, probe the caregiver for the approximate date of birth based on local events calendars.
- Measure recumbent length in children younger than 24 months of age and standing height from 24 months onwards. In case this cannot be adhered to because, e.g. a child is too sick to stand, the software is designed to automatically convert the measurement.
- Always enter the information on whether recumbent length or standing height was measured.
- If age is not known, children who can stand up and are willing to stand should be measured standing whereas children who cannot stand up or are too weak to do so should be measured in recumbent position.
- Always indicate if the child has oedema or not.
- After the age, sex, weight, and length/height information has been entered, the user should check the results by using the graphing option to view single and multiple measurements. If a child appears to have extreme values beyond the flag boundaries s/he should be re-measured immediately.



## 1.4 Motor development milestones

The objective of the motor milestones interface is to monitor the acquisition of the following six gross motor milestones:

- Sitting without support
- Standing with assistance
- Hands-and-knees crawling
- Walking with assistance
- Standing alone
- Walking alone

These milestones are considered fundamental to acquiring self-sufficient erect locomotion and are relatively simple to evaluate (Wijnhoven et al., 2004). The ideal age range to assess the achievement of these motor milestones is between 3 and 24 months. In order to achieve a motor milestone all the criteria for a given milestone need to be observed.

The software allows for two types of assessment, longitudinally via the *Individual assessment (IA)* module and cross-sectionally via the *Nutritional survey (NS)* module. Longitudinal assessments, generally conducted in the context of routine health visits, can monitor the timing and sequence of milestone achievements by individual children. The *NS* module, in turn, permits an evaluation of a child's achievement status in a single episode.

Descriptions of the achievement criteria and standardized testing procedures for each milestone are outlined in the *IA* and *NS* modules and can also be found elsewhere (Wijnhoven et al., 2004).

## 2. WHO Anthro setup

This WHO Anthro software is meant to be applied by any kind of user. Therefore this section is intentionally as non-technical as possible. It presents the minimum information necessary for the user concerning requirements, installation of the software and the default configurations.

### 2.1 Requirements

Before the application can be installed, the Pocket PC must have one of the following operating systems (OS) pre-installed, and a screen resolution of 240×320 (QVGA) or higher:

- Windows Mobile for Pocket PC 2003
- Windows Mobile 5.0 for Pocket PC

Please note that the software is not optimized for devices with square screens (e.g. 240×240 or 480×480), or for horizontal screen layout (you should switch to vertical layout when using Anthro).

To check which OS is currently installed:

- Tap *Start* → *Settings* → *System* → *About*

The *About* screen also shows how much memory space is available.

In addition, the PC used for the installation must have Microsoft ActiveSync v3.7 or higher installed, in order to be able to connect to your mobile device (PCs running Windows Vista do not need ActiveSync). ActiveSync can be downloaded from Microsoft at:

- <http://www.microsoft.com/windowsmobile/activesync/default.msp>

The mobile application will require the .NET 2.0 Compact Framework (SP1) and SQL Server 2005 Compact Edition to run, which will be automatically installed by the setup program if necessary. The user can check if they are already installed by tapping:

*Start* → *Settings* → *System tab* → *Remove Programs*

then verifying that they are listed in Programs in the storage memory.

Minimum available disk space initially needed on the device is around 5 Mb (for the application itself), another 5 Mb for the .NET Compact Framework and the SQL Server 2005 CE, plus sufficient additional



disk space (at least 10 Mb) for Windows Mobile to function properly. Please note that the application size on disk (i.e. the database size) will grow proportionally to the amount of data manipulated in the application (and thus stored in the database).

It is recommended to have a memory card for data storage to avoid potential loss of data in the event of complete battery drain. For more details see section 2.4.3.

## 2.2 Installation

Before installing WHO Anthro for MDs the device and the PC have to be connected and the setup of the mobile device completed (please refer to the user manual of the MD).

The user may choose to either download the software from the WHO web site of the Child Growth Standards at [www.who.int/childgrowth/software/en](http://www.who.int/childgrowth/software/en), or install it from a CD-ROM.

### 2.2.1 About previously installed version 1

The WHO Anthro version 1 (called "Anthro 2005") and version 2 (called "WHO Anthro") are independent. The new version can be installed in parallel. Once familiar with the new version it would be best to uninstall the old one in order to free space. To uninstall:

1. On your PC, in *Add or Remove Programs* (from the Windows control panel), find *WHO Anthro (mobile)* and choose *Remove* (and confirm when prompted)
2. On your mobile device, in *Remove Programs* (in *Start* → *Settings*), find *WHO Anthro* and tap *Remove* (and confirm when prompted)

The old database file is called *zForm.sdf* but due to the changes made to the software's design (new indicators and schema) this can not be imported into version 2.

### 2.2.2 Installing and running the mobile application

To install the application:

- Make sure the mobile device is connected via ActiveSync
- Run *WHO Anthro (mobile) setup.exe* and follow the instructions
- When done, setup will start the mobile device Add/Remove Programs utility and install the application on the device itself
- If the .NET 2.0 Compact Framework or SQL Server 2005 Compact Edition are already installed, the user will be prompted to reinstall them (it is recommended to reinstall them unless certain that the MD has the latest version)
- For Windows Mobile 2003 devices, the user will be prompted by the Add/Remove Program utility to select the location where to install the application and the prerequisites → install on the default directory (answer <Yes>)
- For Windows Mobile 5 devices, the user will be prompted by the device itself for the location where to install the application and the prerequisites; select Device (default choice) for each. When done, the device may ask to reset the device in order to complete the installation; select <OK>

To run the application:

- In *Start* → *Programs*, tap *WHO Anthro* (to continue, see 4.1)

To install WHO Anthro on another mobile device simply disconnect the first, connect the next and repeat the steps above.

#### 2.2.2.1 Troubleshooting

If an error message appears:

- Verify that Microsoft ActiveSync is installed



- Ensure the mobile device is correctly connected to the desktop computer
- Look for the ActiveSync icon ( or ) on the PC taskbar
- If the ActiveSync icon is not on the taskbar, go to <Start → Run> and enter [wcescomm.exe] or [wcesmgr.exe] and click <OK>
- Ensure mobile device is connected and ActiveSync is running; the MS ActiveSync icon should be green ( )
- Complete any setup windows displayed by ActiveSync (i.e. setup of partnerships)

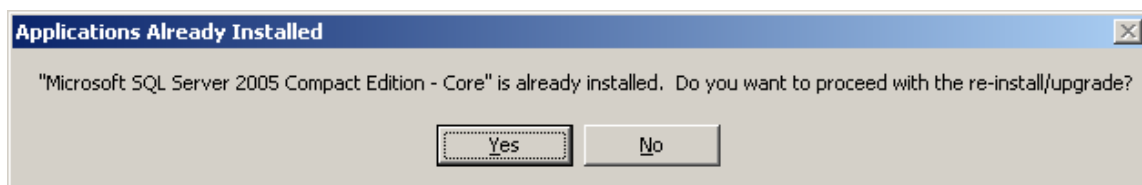
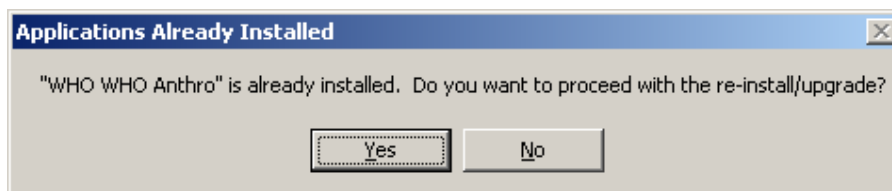
For further troubleshooting of ActiveSync and connectivity issues please refer to the user manual of the mobile device.

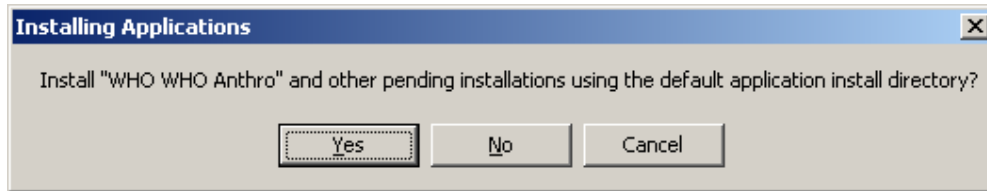
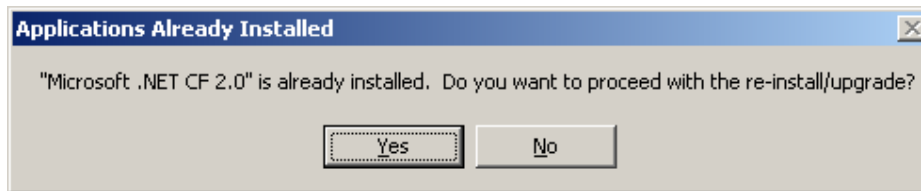
### 2.2.3 Reinstallation of version 2.0

Reinstalling the software will overwrite any existing WHO Anthro files and data. In order to keep the existing data (IA children, NS surveys, and address reference data), please follow the instructions below:

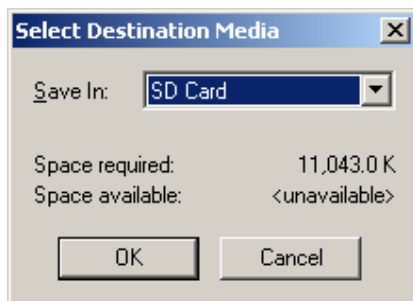
1. Make sure the database folder is currently set to the default location (that is the application folder, by default \Program Files\WHO Anthro). This is defined in the mobile application's settings screen, tab *Data storage*.
2. Do one of the following:
  - If you only want to keep IA children and NS surveys, or some of them, you can export the data you wish to keep before installing the new version (save the exported files in a safe location). Then, after installation, run the application and import your data back. Please note that exporting and importing data can be time-consuming depending on the amount of data.
  - Make a copy of the database file in a safe location before installing the new version – the database file is named *WHOAnthro11.sdf* and is found in the application folder (by default \Program Files\WHO Anthro). After installation, copy the file back to its original location, overwriting the newly installed file. This method allows you to keep address reference data as well.
3. Close all open programs
4. Install the software as described above

Select <Yes> to each of the following messages.





Depending on available system space choose main memory, SD card or IPAQ file store for the destination.



Note: In certain situations it may be necessary to do a hardware reset of the mobile device in order to remove any corrupt system settings and files before reinstalling the software and other required components. Refer to the MD manual for instructions on how to proceed in this case.

## 2.3 Software removal

The software has two main components: The installation files on the PC and the software files on the MD.

The steps to remove the WHO Anthro software are as follows:

- On the MD make sure WHO Anthro is not running
- To check, tap <Start → Settings → System → Memory → Running Programs>.
- If it is running close it by selecting it in the list and tapping <Stop>
- Tap <Start → Settings → System → Remove Programs>
- In the list of programs select "WHO WHO Anthro"
- Tap <Remove>
- Tap <Yes> to the message box

In addition there are other components that can be removed using the same approach as above:

- Microsoft .NET 2.0 Compact Framework
- Microsoft SQL Server 2005 CE

Users should be aware that other installed software could be using some of these components. Therefore, please check the manual of other installed software before removing any of the above listed components.

Then on the PC, to uninstall WHO Anthro (mobile):

- <Start → Control Panel → Add or Remove Programs>





- In the list select *WHO Anthro (mobile)* and click <Remove>

## 2.4 MD settings and data storage

### 2.4.1 Security issues

It is highly recommended that users have a PC with updated windows and antivirus software. To update the PC visit [www.windowsupdate.com](http://www.windowsupdate.com).

WHO Anthro has a wide range of security functions, e.g. encryption of data, but this will not prevent unauthorized access to data if a user has not logged off.

**Note:** There is no automatic log off function.

An additional level of security can be introduced by using the existing security function found in the mobile device itself. This function allows for password protection of the MD unit itself.

- <Start → Settings → Password>
- Select *Prompt if device unused* for checkbox, and select the preferred *Number of minutes*, 0 minutes is recommended as this refers to number of minutes after the device has been turned off or has entered "standby" mode
- Set a simple 4-character (i.e. digit or alphanumeric) password
- Tap <OK>
- Since data may be lost if the battery is discharged, change power settings to turn off the device if unused: <Start → Settings → System → Power → Advanced> and set the *Turn off device if not used* to preferred timings (remember to select for both battery and external power)
- Tap <OK>

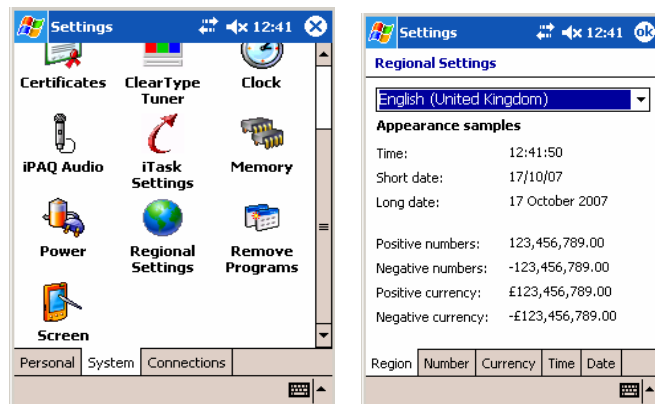
### 2.4.2 Change of language and regional settings

A number of functions of WHO Anthro depend on the regional settings of the mobile device, e.g. language, date and number settings.

To change from the default language (English) to French or Spanish, the user has to change the regional settings by tapping:

<Start → Settings → System → Regional Settings>

Then select the preferred language by choosing from the drop-down menu (for details please refer to the MD manual).



If French or Spanish is selected as the working language but the operating system language of the MD is English, the buttons on message boxes will still read, e.g. <OK> and <Cancel>. This behaviour is standard in .Net.

### 2.4.3 Data storage – warning symbol

The storage structure of a mobile device is frequently divided into ROM, RAM and Flash:

- ROM is where the MD's system is stored and is inaccessible as a data storage location; the ROM is stable even if power is lost.
- RAM is where the applications and \My Documents\ folder are stored. Any files stored in RAM are deleted if battery power runs out.



- Flash-based memory is in the form of a memory card or a built-in storage location, e.g. iPAQ File Store on Hewlett Packard devices and LOOX store on Fujitsu-Siemens devices. It is stable and does not require any power to keep the stored data.

Most mobile devices use the RAM for data storage, which requires power to keep the data stored. Consequently, if the battery of the device gets completely discharged or removed for more than a hardware dependent number of minutes (see MD manual for details), any data stored in RAM will be lost. Thus, it is extremely important to change the data storage from the default location, "*Program Files\WHO Anthro\Data*" to a safe one (see section 4.4 *Settings*).

Upon first installation users will therefore see a red warning symbol on the main page (see image to the right). This warning symbol alerts the user of the potential problem related to the default internal data storage. Once the data storage is safe, the warning symbol disappears.



Some devices running Windows Mobile or newer use a mixture of Flash and RAM, thereby avoiding the potential problem described above. For those devices this error message is probably not relevant.

## 2.4.4 System backup

It is recommended to make a backup of the database on a memory card or an internal safe storage folder. Most mobile devices include systems for backup and restoring both data and software. If this is not available, users can apply the copy method outlined in section 8.2 describing how to copy files to a memory card or the PC.

For WHO Anthro the most important folder to make backups of is the local storage folder as defined in the settings. In addition it is advisable to make a backup of the software folder found in *Program Files\WHO Anthro\* on the mobile device.

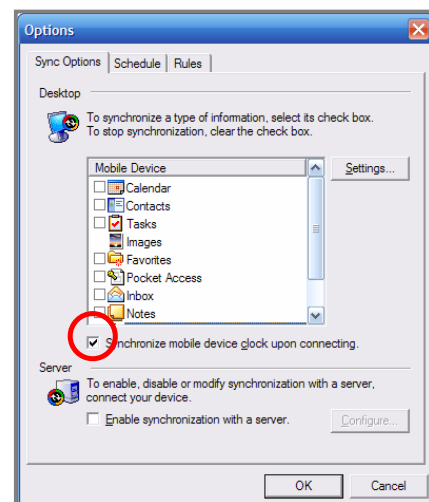
## 2.4.5 Date synchronization and settings

The user is advised to ensure that the mobile device is setup to automatically synchronize the system date and time with the desktop computer or laptop when connected via ActiveSync.

To set up and/or check date synchronization:

- Look for the MS ActiveSync icons (🟢 or 🟡) on the PC taskbar
- If this icon is not visible, go to *<Start → Run>* and enter [wcescomm.exe] or [wcesmgr.exe] and click *<OK>*
- Ensure ActiveSync icon appears green (🟢) before continuing
- Left click on the ActiveSync icon and select *<Options>* or *<Tools → Options>*
- Make sure that *Synchronize mobile device clock upon connecting* is checked (see image).

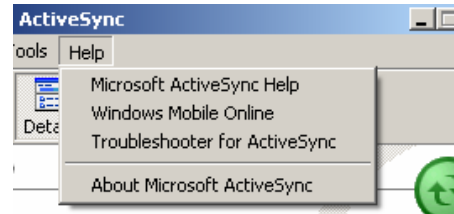
For "Guest" connections (i.e. with other MDs) the clock can also be adjusted manually through *<Start → Settings → System → Clock & Alarms>*.





To check connection settings of ActiveSync select → *File* → *Connection Settings*>

For troubleshooting ActiveSync and connectivity issues please use *Help* function or refer to the MD manual.



## 3. Basic software functions

### 3.1 Icons and navigation

WHO Anthro uses the following command icons with consistent functions:

Icon	Description
	Add
	Back/Return to the higher-level screen
	Cancel
	Delete (child, record, survey, etc.)
	Edit
	Graph
	Import
	Open
	Reset
	Restore
	Save
	Search
	Archive/import/export
	Toolbar pull-up menu
	Records
	Results
	Settings
	Change user or tap pull-up menu ▲ to manage user
	Visits
	z-score/percentile

#### 3.1.1 Close button

The => *Close* button on the top right corner allows the user to minimize the software at any time. When the software icon is tapped again the minimized window will be opened directly. Any unsaved data remains unsaved and the user has to tap to avoid losing the entered information. To quit the application select *Exit* from the toolbar pull-up menu.



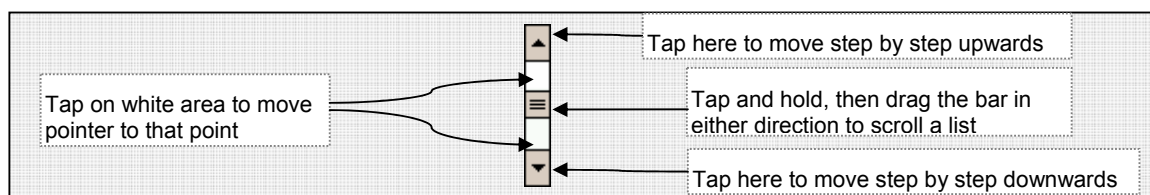
### 3.1.2 "Wait" cursor

Some software functions take time and whenever the user has to wait until a certain task is completed, a "wait" cursor is displayed. The image depends on the operating system used. Generally it looks similar to the image below.



### 3.1.3 Navigating lists

Several WHO Anthro windows have scrollbars which allow users to move easily through long lists.



### 3.1.4 Changing column widths

To change the column widths in any spreadsheet-type lists one has to use the stylus, tap and hold the edge of a column header and then change the size by dragging the stylus to the left or the right. This change is not permanent; column widths are reset to the default when the program is closed and restarted.

## 3.2 Data input

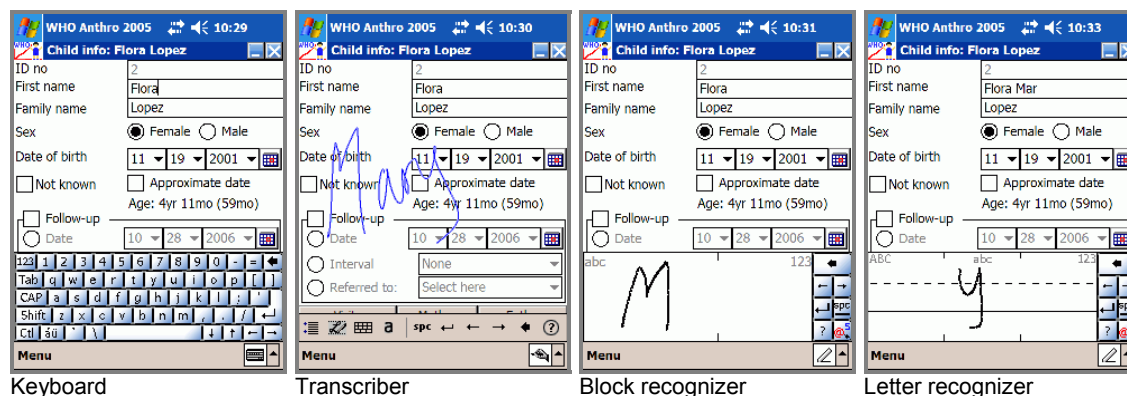
Most mobile devices use an onscreen keyboard and a pointing device called stylus instead of the conventional keyboard and mouse. The screen is touch-sensitive and tapping on the screen with the stylus has the same effect as moving the mouse to a point and clicking on it (left click). The equivalent to the right click with the mouse is to tap gently with the stylus on the screen and hold it for about 1 second. This will display a context menu as does the right click on a desktop computer.

The following section describes the different special input methods used on a mobile device in general and WHO Anthro in particular.


### 3.2.1 Text input

Most mobile devices have no external keyboard or keypad to key-in data. Instead, mobile devices have a touch-sensitive screen that allows for different modes of data-entry.


- Onscreen keyboard
- Transcriber
- Block recognizer / Letter recognizer





These input modes are system-specific functions that are part of any mobile device. To specify the preferred mode, the user has to tap on the **upward arrow (▲)** next to the keyboard icon  and select one. The currently selected mode is marked with a bullet point.

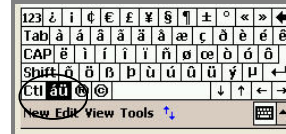
### Onscreen keyboard

To open and close the keyboard, tap on  which functions as a toggle button. By default the regular keyboard appears in the lower part of the screen. To use the keyboard the user has to tap with the stylus on the letter buttons.

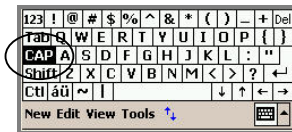
There are four keyboard layouts: Regular, <CAP=caps lock>, <âü=international> and <123=numeric>. These are shown in the images to the right. To select/de-select a layout mode the user has to tap on the circled toggle buttons.



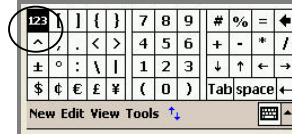
Turn on regular keyboard



Display international characters




Select CAPS Lock



Display numeric characters

The user has also the option to select a regular keyboard without numeric characters that takes up less screen space. To activate this option tap <#Start → Settings → Input> and select *Keyboard* in the input field and check the *Large keys* options. This option is convenient for keying in lots of text; numeric characters are still available through the <123>=<numeric> button on the keyboard itself.

The software has been designed to automatically hide the onscreen keyboard whenever it is not needed; and when the keyboard covers parts of the window, the user can manually hide the keyboard by tapping on .

### Transcriber

In the Transcriber mode the user writes directly on the screen and the MD converts the handwriting into digital letters. This feature works well depending on the user's experience and handwriting skills.

### Block/Letter recognizer

The Block and Letter recognizer are two methods similar to the Transcriber where the user can write one letter at a time in a specified region of the screen. The letters are recognized either through predefined graphics or by writing actual letters.

As an alternative users can connect an external keyboard to the MD. These keyboards have the advantage that they do not occupy any of the limited screen space on the mobile device. Please refer to the manual of your device for details about which external keyboards can be connected.

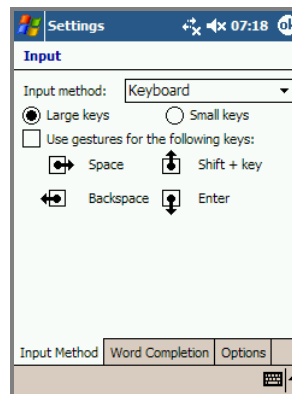
## 3.2.2 Numeric input

Wherever the WHO Anthro application requires numeric data or digit input, as soon as the input field is touched with the stylus a numeric keypad opens (see image to the right). Numeric data can also be entered in regular text fields using the keyboard as described above. The numeric keypad reduces the risk of data-entry errors and eliminates the need for switching between different keyboard layouts.



Numeric input panel

The functions of the buttons on the numeric keypad are as follows:



Select Keyboard - Large keys



- After entering the numeric value the user has to tap on the =><OK> button to confirm the entry
- <C> clears the entered value
- <+/-> inverts between negative and positive numbers
- deletes the last entered digit
- <.> is the default decimal separator; <.> or <,> appear depending on the selected regional settings of the mobile device (for details on regional settings see section 2.4.2)
- =><Cancel>, cancels the changes made and closes the numeric input panel

### 3.2.3 Date input

In WHO Anthro two dates are of critical importance, i.e. date of visit and date of birth. In general the way dates are displayed, e.g. calendar type and order of year, month and day depends on the regional settings of the MD. The images below show the short date appearance for the *Regional setting* of <English (United Kingdom)>. For details on regional settings see section 2.4.2.

18/09/07  
Date of visit

Date of birth 18/09/06  
Age: 11mo  
☐ Approximate date  
☐ Unknown date  
Date of birth selector

The user has several options of how to enter dates in WHO Anthro.

#### 3.2.3.1 Keyboard

One option is to tap on the date field, then on to open the keyboard and type in the value. Invalid dates are not accepted (e.g. 30 February).

#### 3.2.3.2 Calendar

Another option is to use the calendar, which offers multiple ways of selecting dates. To open the calendar, tap on <▼> to the right of the date field.

September 2007  
M T W T F S S  
27 28 29 30 31 1 2  
3 4 5 6 7 8 9  
10 11 12 13 14 15 16  
17 18 19 20 21 22 23  
24 25 26 27 28 29 30  
1 2 3 4 5 6 7  
Today: 18/09/07

Calendar view to select day within open month

September 2007  
M T W T F S S  
27 28 29 30 31 1 2  
3 4 5 6 7 8 9  
10 11 12 13 14 15 16  
17 18 19 20 21 22 23  
24 25 26 27 28 29 30  
1 2 3 4 5 6 7  
Today: 18/09/07

Change year via scroll buttons

January 12:28  
February  
March  
April  
May  
June  
July  
August  
September  
October  
November  
December  
18/09/07

Change month from list

Use scroll buttons (next and previous month)



To select a day within the displayed month simply tap on the date of choice. Tapping on the <◀>=><Previous month> or <▶>=><Next month> buttons changes the display one month at a time in the direction selected.

Tapping on the month text, in this example **September**, will open a list of all the months, from which the user can select by tapping on any month. Tapping on the year text will activate scroll buttons so that it is possible to navigate up or down year by year. Tapping on **Today** will automatically shift the calendar and selected date to the current system date.



### 3.3 Data collection, calculations and display

The child's sex, age, oedema (*No* or *Yes*), weight, length/height and type of measurement (*Recumbent* or *Standing*) are the basic variables. Additional measurements for head circumference (HC), arm circumference (MUAC), triceps skinfolds (TSF) and subscapular skinfolds (SSF) can be included to derive the complete set of nutritional status indicators.

Any data from previous visits (in *IA*) or survey records (in *NS*) can be changed. Note that this can also happen unintentionally. In this case, or if the user is not sure whether s/he made an accidental change, tap on  and exit the child record without saving. Then re-open the same record before proceeding to enter any new data. The  function is similar to *<Undo>*.

#### 3.3.1 Age

The software uses date of birth (DoB) and date of visit (DoV) to derive and display age in years and completed months (total completed months in parenthesis). The user is advised to double check with the caregiver that this information is correct.

To account for leap years, age in completed months is calculated as follows. One year has 365.25 days and thus one month (365.25 divided by 12 [months]) is equal to 30.4375 days. A child born 11 November 2004 and measured 11 November 2005 appears hence as having an age of 11 completed months (365 divided by 30.4375 equals 11.99). However the nutritional status indicators are derived for the child's exact age in days calculated using DoB and DoV.

The reason for deriving age in days is that all age-based indicator tables of the WHO Child Growth Standards are by units of days.

The software was specifically designed to enhance the quality of age estimation. If the exact **day of birth** is unknown, the user should fill in the year and month of birth and tick the box next to "Approximate date". When that field is ticked, the software attributes a random day to complete the date of birth. This date is then used to derive an exact age in days.

The child's age is an important piece of information and those collecting data should probe the child's caregiver to obtain at least an approximated date of birth (i.e. year and month). A useful tool to obtain an approximate DoB is a local calendar. For example, Annex 1 of the FAO field manual (FAO, 1990) provides information on how to develop such a local events calendar.

Only if there is absolutely no recollection of when the child was born, should the user tick the box next to "Unknown date". If that box is ticked, none of the age-based indicators can be derived, and only a weight-for-height z-score (WHZ) and percentile (WHP) will be calculated. In a survey the child will thus only contribute to the overall prevalence of this indicator.

#### 3.3.2 Oedema

Children with oedema have swollen limbs and may look well fed. Having oedema, however, is a clinical sign of being severely undernourished. Ideally, any suspected child should be assessed for oedema before measuring weight. To determine whether oedema is present, grasp the foot so that it rests in your hands with your thumb on top of the foot. Press the thumb down gently for a few seconds. The child has oedema if a pit (dent) remains in the foot after lifting your thumb. If the child has oedema of both feet, fluid retention increases the child's weight, masking what may actually be very low weight. In case the child has oedema the user should tick the respective box in the data-entry window. Consequently no weight measurement needs to be taken as it will be flawed. In case the user measures the child's weight and ticks the "Yes" button for oedema, the software discards this entered weight value for such a child and only computes the weight-independent indicator z-scores and percentiles. In deriving prevalences at population level, however, a child with oedema has to be counted as below  $<-3$  SD for all weight-related indicators. This logic is followed in all analysis options of WHO Anthro for PC in the *Nutritional survey* module (see WHO Anthro for PC manual).

The default status for the data-entry window in all modules is that a new child has "No" oedema. If the child has oedema the user has to tap the respective radio button.





### 3.3.3 Anthropometric data

Detailed procedures for measuring anthropometry can be found in the MGRS anthropometric training video and in the module, *Measuring a Child's Growth*, of the WHO child growth assessment course (available at [www.who.int/childgrowth/training](http://www.who.int/childgrowth/training)) It is recommended that those responsible for measuring anthropometry use these resources or be trained to take reliable measurements.

To enhance validity at data-entry and data-import, the software is programmed to accept the following value ranges (inclusive at min and max) for each measurement. Should the user enter a value outside those ranges, the entry field returns to blank.

Measurement	Min	Max
Weight (kg)	0.9	40.0
Length/height (cm)	38.0	139.0
Head circumference (cm)	26.0	60.0
Arm circumference (cm)	7.0	29.0
Triceps skinfold (mm)	2.0	32.0
Subscapular skinfold (mm)	2.0	34.0

#### Weight

Measurements should be entered in kilograms with maximum 2 decimals.

#### Recumbent length and standing height

Given that measuring length and height can be particularly difficult, users are advised to consult guidelines, e.g. <http://www.who.int/childgrowth/training/en/>. Length and height measurements should be entered in centimetres with maximum 2 decimals.

In line with standard measurement procedures, the software derives for children younger than 24 months length-based indicators, and for children 24 months and older height-based indicators. There exist settings and scenarios, however, where it is not possible to comply with this recommendation and a child older than 24 months has to be measured lying down — for example when a child is too sick and too weak to stand, or when, because of time/equipment constraints, it is only possible to measure all children lying down. In these instances the software makes the necessary adjustment by subtracting 0.7 cm from the child's length to derive an estimated height. Similarly, if a child is measured standing when s/he should be measured in the recumbent position, given his/her age, the software adds 0.7 cm to derive an estimated length. The 0.7 cm difference between length and height is based on the analysis of the MGRS sample of children (18-30 months of age) who had both length and height measurements taken.

**Note:** To obtain results of the length/height-based indicators, the user must always specify and tick the appropriate button, indicating how the child was measured, i.e. in recumbent or standing position.

When interpreting the results, the following should be kept in mind: The software converts the length/height measurement to conform to the foregoing recommendation and uses that converted value for deriving all relevant indicator results (including BMI, see 3.3.5). The software interface always shows the corresponding indicator name, i.e. length-for-age for all children younger than 2 years (or up to 730 days, inclusive) and height-for-age for all children 2 years and older (731 days or more). Therefore for a child that was measured lying down but is older than 2 years, the indicators will read: Weight-for-height and height-for-age; and the BMI as well as the BMI-for-age z-score are derived based on the converted height from length.

If age is not known but the type of measurement (i.e. recumbent or standing) is given, the software uses that information to derive either length- or height-based indicators (see section 3.3.10). If neither age nor type of measurement is known, the software considers any measurement below 87 cm as length and any measurement 87 cm and above as height. The cut-off point of 87 cm reflects the standards' median of boys' and girls' length and height at 24 months. According to the WHO standards the median height is 87.1 cm for boys and 85.7 cm for girls, and the median length is 87.8 cm for boys and 86.4 cm for girls. The mean of these four values is 86.75 cm (see also 3.3.10).

#### Head- and arm-circumference

Enter the measurement result in cm with up to 2 decimals.





### Triceps- and subscapular skinfolds

Enter the measurement result in mm with maximum 2 decimals.

### 3.3.4 Motor development

To complement the assessment and monitoring of a child's physical growth, the *IA* and the *NS* the modules of WHO Anthro enable the user to collect and analyse children's motor development data for six gross motor milestones (i.e. Sitting without support, standing with assistance, hands-and-knees crawling, walking with assistance, standing alone and walking alone). This feature is recommended for use in children 3-24 months of age. Achievement is judged by observing several criteria per milestone. Given that judgment is by definition prone to bias, observers should be trained to follow standardized procedures in assessing milestone achievement (for details see Wijnhoven et al., 2004).

### 3.3.5 Results

All software modules enable the user to derive nutritional status information (in z-scores and percentiles) for the following indicators:

- Weight-for-length/height
- Length/height-for-age
- Weight-for-age
- BMI-for-age
- Head circumference-for-age
- Mid-upper arm circumference-for-age
- Triceps skinfold-for-age
- Subscapular skinfold-for-age

For details on how to interpret each of the nutritional status indicators, users are referred to the WHO Technical Report Series 854, Physical status: the use and interpretation of anthropometry, chapter 5, pp.162-171 (WHO, 1995), and the training course on Child Growth Assessment, Module C: Interpreting Growth Indicators ([www.who.int/childgrowth/training](http://www.who.int/childgrowth/training)).

### 3.3.6 BMI

When weight and length/height have been entered the software derives BMI ( $\text{kg/m}^2$ ) for the child and the parent(s) and/or caregivers. This index has been added to the other indicators of child nutritional status as it is commonly used to assess nutritional status in older children. BMI values are calculated based on length for all children younger than 2 years, and on height for children 2 years and older. If a child younger than 2 years has been measured standing — the standard procedure is to measure in recumbent position — 0.7 cm is added to the child's height and the converted length is used to calculate the BMI. In case a child aged 2 years or older has length measured, 0.7 cm is subtracted to convert it to a height measurement before the BMI is derived. In case the age of the child is unknown the measurement in cm given is used without any conversion to derive the BMI value. A child's BMI value has to be distinguished from the BMI-for-age z-score value which is based on the WHO standards and appears with the other indicators' results.

On the parents window the user has the option to collect the adults' weight and height data to derive their BMI. This information can be useful in the interpretation of the child's nutritional status. For details on the measurements and the interpretation of BMI in adults users are referred to the relevant WHO publications (WHO, 1995; WHO, 2003).

### 3.3.7 Percentiles and z-scores

The default classification system used to present child nutritional status is that of z-scores or standard deviation (SD) scores. This classification system has been recommended by WHO for its capability to describe nutritional status including at the extreme ends of the distribution and allow derivation of summary statistics, i.e. means and SDs of z-scores (WHO, 1995).



Given the widespread use of percentiles in clinical settings the software also derives these. The percentiles are based on exact z-scores. Therefore, use of the displayed z-score value (rounded to 2 decimals) to hand-calculate the percentile might yield a slightly different result from that displayed by the software.

The z-scores appear as not available (NA) when:

- child's age is above 60 completed months
- child's age is unknown, consequently WAZ, HAZ, BAZ, HCZ, MUACZ, TSFZ and SSFZ are NA
- child's length is <45 cm or >110 cm and his/her age is less than 24 months, consequently all length-based indicators are NA
- child's height is < 65 cm or >120 cm and his/her age is 24 months or older, consequently all height-based indicators are NA
- child's age is less than 3 months, consequently MUACZ, TSFZ and SSFZ are NA

Please note that percentiles read "NA" for all z-score values <-3 SD and >+3 SD because percentiles beyond  $\pm 3$  SD (equivalent respectively to the 0.135<sup>th</sup> and 99.865<sup>th</sup> percentiles) are invariant to changes in respective z-scores.

The following cut-off classifications indicate the different levels of severity:

- Weight-for-age and length/height-for-age: <-3 SD, <-2 SD, >+2 SD and >+3 SD
- Weight-for-length/height, BMI-for-age, head circumference-for-age, mid-upper arm circumference-for-age (MUAC-for-age), triceps and subscapular skinfold-for-age: <-3 SD, <-2 SD, <-1 SD, >+1 SD, >+2 SD and >+3 SD

In the percentile classification system for all indicators the following common cut-offs are used: 3rd, 15th, 50th, 85th and 97th percentiles.

### 3.3.8 Graphs

Graphing results enables the observer to visualize measurements in relation to the standard curves. This display feature provides a means of sharing the results with the child's caregiver and also to visually assess the growth pattern over time. In view of the likely continuation of using child growth charts on paper, the graphing option enables the user furthermore to double check that the entry made on the paper chart corresponds with the display on the mobile device screen.

The user can view the graph for each indicator using either the z-score or percentile classification system.

The graphs display:

- Weight-for-length between 45 and 110 cm
- Weight-for-height between 65 and 120 cm
- Weight-for-age from birth to 5 years (0-60 completed months)
- Adjacent length-for-age and height-for-age with a vertical line at 2 years of age to mark the separation of length and height; from birth to 5 years (0-60 completed months)
- Adjacent length- and height-based BMI-for-age with a vertical line at 2 years of age to mark the separation of length and height; from birth to 5 years (0-60 completed months)
- Head circumference-for-age from birth to 5 years (0-60 completed months)
- MUAC-for-age from 3 months to 5 years (3-60 completed months)
- Triceps skinfold-for-age from 3 months to 5 years (3-60 completed months)
- Subscapular skinfold-for-age from 3 months to 5 years (3-60 completed months)

The graphed curves correspond to the common cut-off levels. For the z-score classification system the lines displayed are:



- Weight-for-age and length/height-for-age: -3 SD, -2 SD, median, +2 and +3 SD
- Weight-for-length/height, BMI-for-age, head circumference-for-age, MUAC-for-age, triceps and subscapular skinfold-for-age: -3 SD, -2 SD, -1SD, median, +1 SD, +2 SD and +3 SD

Note that measurements corresponding to missing z-score values, presented as "NA", are not plotted.

Using the percentile classification system the following common cut-off lines are displayed for all indicators: 3rd, 15th, 50th, 85th and 97th percentile.

Even though percentile values smaller than 0.135<sup>th</sup> and beyond 99.865<sup>th</sup> (equivalent to -3.00 and +3.00 SD, respectively) read "NA" in the results window, the corresponding anthropometric measurements are plotted as long as they fall within the limits of age, kg, cm and mm represented in the respective graphs.

The following colour codes are applied to visually distinguish the different levels of severity on the graphs:

Colour	z-scores	Percentiles
Green	Median	50th percentile
Gold	-1 SD and +1 SD	3rd and 85th percentiles
Red	-2 SD and +2 SD	15th and 97th percentiles
Black	-3 SD and +3 SD	NA*

\* NA = not available

### 3.3.9 Note on z-score/percentile calculations

If age is missing or unknown only WHZ and BMI will be calculated.

If *Weight* is missing, the software can derive HAZ, HCZ, MUACZ, TSFZ and SSFZ; while WHZ, WAZ, BAZ and BMI cannot be calculated.

If *Length/Height* is missing, the software derives only WAZ, HCZ, MUACZ, TSFZ and SSFZ; while WHZ, HAZ, BAZ and BMI cannot be calculated.

If a child has oedema the software derives only HAZ, HCZ, MUACZ, TSFZ and SSFZ, while WHZ, WAZ, BAZ and BMI are not calculated.

To calculate age the software applies the following procedure:

If both, DoB and DoV are valid, then it calculates:

Age (in days) = DoV - DoB

The result is used for obtaining z-scores and percentiles, and is stored with all decimal places.

The child's age influences how the software handles the variables *Length/Height* and *Measured*. For example, if a child is 24 months or older and has a length measurement, 0.7 cm is subtracted to derive an estimated height. Similarly, if a child is younger than 24 months and is measured standing, the software adds 0.7 cm to derive an estimated length.

### 3.3.10 Use of length and height

If age and type of measurement are known (following the recommended data collection method), WHO standards require conversion from length (l) to height (h) depending on age (i.e. if a child younger than 2 years has been measured standing or a child is aged 2 years or older had length measured). The possible scenarios are summarized below:



Age group (months)	Type of measurement (l/h) <sup>1</sup>	Conversion	Data tables
<24	l	None	Length table 45-110 cm
<24	h	$h + 0.7$ cm	Length table 45-110 cm
≥24	l	$l - 0.7$ cm	Height table 65-120 cm
≥24	h	None	Height table 65-120 cm

<sup>1</sup> l = recumbent length; h = standing height

When age is known but not the type of measurement:

Age group (months)	Data tables
<24	Length table 45-110 cm
≥24	Height table 65-120 cm

When type of measurement is known but not the age:

Type of measurement (l/h) <sup>1</sup>	Data tables
l	Length table 45-110 cm
h	Height table 65-120 cm

<sup>1</sup> l = recumbent length; h = standing height

If neither age nor type of measurement is known:

Length/height (cm)	Data tables
<87	Length table 45-86.9 cm
≥87	Height table 87-120 cm

## 3.4 Data variables and codes

### 3.4.1 Description of standard variables

The data collected in the *Individual assessment* and *Nutritional survey* modules have a predefined schema with set variable names and data types.

Annex 1 presents the detailed tables explaining format and the variables found in an exported file (\*.txt, \*.csv and \*.xml) from the *IA* and the *NS* modules.

### 3.4.2 Data codes

Missing data or calculations outside valid ranges are exported as blank field values.

#### 3.4.2.1 Flags and error tracking

The following lower and upper SD boundaries are the set flag limits for identifying any extreme or potentially incorrect z-score values for each indicator.

Indicator	Lower SD	Upper SD
WAZ	-6	+5
HAZ	-6	+6
WHZ	-5	+5
BAZ	-5	+5
HCZ	-5	+5



Indicator	Lower SD	Upper SD
MUACZ	-5	+5
TSFZ	-5	+5
SSFZ	-5	+5

In the *Results* window a separate column shows the attributed flags for each indicator. Missing z-score values appear as *NA* and are considered also as flagged.

In a nutritional survey analysis all flagged z-scores should be excluded. When choosing any of the report options in WHO Anthro these flags are applied automatically. It is recommended that users who export their data for further analysis in a different software program apply the same flag limits in order to obtain consistent results.

The text that appears below the results is intended to assist the user in identifying potential errors of data-entry related to the most commonly used weight- and height-related indicators.

Flag	Error tracking
None	Valid z-scores were derived for all indicators.
WHZ	Check for the minimum and maximum limits of length (45 cm and 110 cm) and height (65 cm and 120 cm). If the child's length or height is within those limits, this could be an extremely thin or heavy child. If height is incorrect, the HAZ would be expected to be close to an extreme value (but not extreme enough to be flagged), and if weight is incorrect, then the WAZ would be expected to be close to an extreme value (but not extreme enough to be flagged).
HAZ	This could be an extremely short or tall child, but it is recommended to double check the height data to assure that it is correct and consistent on the data collection form and the computer file. Alternatively, the age could be incorrect; therefore one should look at the WAZ value to see if it appears extreme.
WAZ	Either weight or age may be incorrect.
WHZ & HAZ	Length or height is most likely incorrect or missing.
WHZ & WAZ	Weight is likely to be incorrect or missing (it could also be due to the child being classified as having oedema).
HAZ & WAZ	Age information is most likely incorrect, missing, or out of range.
WHZ, HAZ & WAZ	This may indicate that sex is unknown, or that at least two of the variables age, weight and height, are missing, incorrectly recorded, extreme, or beyond the limits of the growth standards.
BAZ	This may indicate an unusual combination of WAZ and HAZ. Given the close association between BAZ and WHZ, in most cases where BAZ is flagged WHZ also will be flagged.

To date there is little experience with limits and combinations of the indicators head circumference-for-age, MUAC-for-age, triceps and subscapular skinfold-for-age. Therefore no error tracking assistance has been derived for these indicators.

### 3.4.2.2 Motor milestone codes

The exported motor milestones data are coded "0 = no" and "1 = yes" for each of the six motor milestones to indicate whether it has been "Assessed" and "Observed" or "Reported" (relevant in the *NS* module).

Note: Once a milestone has been achieved, i.e. the response is "1" in the column "Observed", data for all subsequent visits will carry "0" for the "Assessed" and "1" for "Observed" column, respectively, because having been observed, the child no longer needs to be assessed for that milestone.

If the child was not assessed for motor development the exported field values will be empty.

Colour codes visualize the child's current development status. These codes are specific to the *IA* and *NS* modules and are thus described in the respective sections (see 6.4.5.1 and 7.2.4.4).



### 3.4.2.3 Codes for *Follow-up -> Interval*

Selection	Export code (number)
Urgent	0
Next day	1
In 2 days	2
In 3 days	3
In 4 days	4
In 5 days	5
In 6 days	6
Next week	7
In 2 weeks	8
In 3 weeks	9
In 4 weeks	10
Next month	11
In 2 months	12
In 3 months	13
In 4 months	14
In 5 months	15
In 6 months	16
In 7 months	17
In 8 months	18
In 9 months	19
In 10 months	20
In 11 months	21
Next year	22
In 2 years	23
In 3 years	24

### 3.4.2.4 Codes for *Follow up -> Referred to*

Selection	Export code
Hospital	#0
Clinic	#1
Nutrition Centre	#2
Other, please specify	Other_Specify
	Maximum 50 characters

### 3.4.2.5 Export of additional data

In the exporting process, the data collected using the *Manage additional data* function (see section 6.4.4) appear in xml format in one column, labelled "*AdditionalData*". If needed for further analysis the data in this column can be split by saving it in \*.txt or \*.csv format, then importing into Excel, selecting "*Fixed width*" and specifying the columns.

### 3.4.2.6 Date format and decimal separator

The decimal separator for number formats used for exporting data depends on the regional settings of the mobile device. These settings can be different from the settings of the PC that the mobile device is connected to.

The date in the exported file has a time stamp attached (see Annex 1). To delete the time stamp and/or change date layout, import the file to a PC e.g. into Excel and select:



Format → Cells → Date and select the preferred format.

## 4. Start-up and introduction to first windows

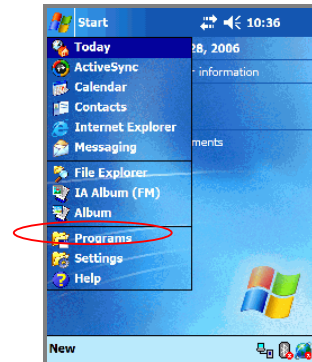
To start WHO Anthro after the installation has been completed do the following:

Tap <Start> → Programs

Tap on WHO Anthro icon



to start the application



Today/Desktop with open Start menu

After the wait-cursor has disappeared, the Login window opens.

Note: If your screen shows too little contrast or you would like to change colour theme please consult the MD manual.

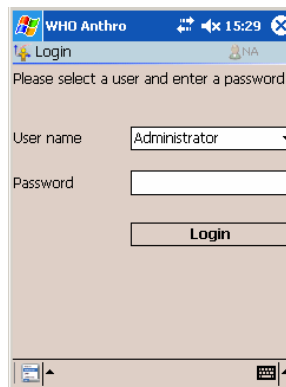
### 4.1 Login window

To safeguard against unauthorized access the user is required to enter a username and password before starting the application. The default user is the *Administrator* and the default password is [admin]. The user is strongly advised to change this password immediately after installation for security purpose. The management of users is described in the next section.

#### Login

To log in the user has to select a system user from the list and then tap on the *Password* field to enter the password. Entering an incorrect password triggers a pop-up message. To close that message window, tap <ok>. There is no limit to the number of times a user can try to log in. For information on first time login, see below.

If the automatic enabling of the keyboard does not work or some other input mode appears, the likely reason is that a different mode is selected. For instructions on how to change data-entry mode on the mobile device see section 3.2.1.



Login, select username and enter password



Login failed

#### 4.1.1 First time login


Tap on the password field to open the keyboard and key in the default password [admin]. Then tap on the <Login> button.



From the *Welcome* or *Main* window of the software (see image to the right) the user can open any of the 3 modules: *Anthropometric calculator*, *Individual assessment* and *Nutritional survey*.


The red warning symbol indicates that the data are currently stored on the MD's internal memory. To safeguard against accidental loss the user is strongly advised to secure data storage by changing the default location (see section 4.4).

Tapping on  opens the Login window.

To change the password, tap pull-up menu (▲) next to  and select *Manage users*.

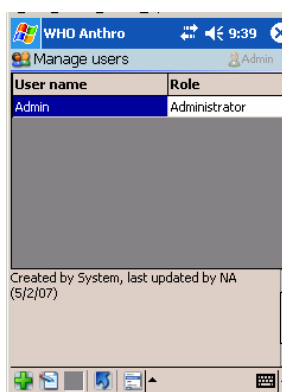


*Welcome or Main window*

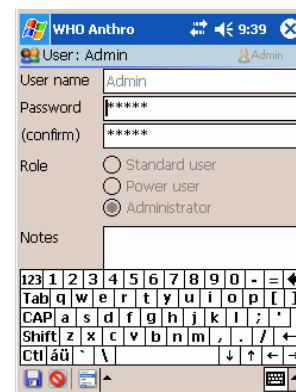
To change the default password (or edit a password), tap on  to open the user-specific window. Highlight the existing password with the stylus and use backspace on the keyboard to delete it. Then enter a new password for the Administrator account and confirm in the field below.

Tap on  to save the changes.

For all succeeding logins the newly defined password must be used unless changed again as described.



*Manage users window*



*Enter & confirm new password*

Be sure to create a password that you will not forget, as a forgotten password is equal to lost data. In case you forget the password you have to un-install and re-install WHO Anthro, and any data collected will be lost.

Username and password must be at least 4 characters long and can contain any combination of letters and/or numbers.

## 4.2 *Welcome or main window*

### 4.2.1 *Access modules*

From the *Main* window the user can access the software modules by tapping on the respective buttons next to their names:






to open *Anthropometric calculator*



to open *Individual assessment*



to open *Nutritional survey*

The icons , , and  within the module buttons are shortcuts to the respective functions (see 3.1).





The functions and options for each module are presented in the respective sections. Given the limited screen size of a MD, each module is broken down into several windows including sub-sections.

## 4.3 Manage users windows

WHO Anthro has built-in functions to restrict data access and usage of the system. All collected data are stored in an encrypted, password-protected database. Access to the database requires that users log in as a defined system user, whose username and password have been stored in the database itself. This allows moving data files between mobile devices without having to worry about unwanted access to the data stored in the files. Access to data files is possible only after a successful login.

The user information in WHO Anthro is stored and enables the tracking of who created a child record and who last modified it.

### 4.3.1 User properties


There are three possible types of users: *Standard*, *Power* and *Administrator*.

*Standard* users can modify their own password, create and modify any data, but delete only their own data, i.e. what they have created. They have no access to user management functions.


*Power* users can modify their own password, as well as create, modify and remove *Standard* user accounts; they have no access restrictions on any functionality.

The *Administrator* has the same privileges as *Power* users, plus he/she can create, modify and remove *Power* user accounts. There can only be one administrator, and it is the default account that comes with the installation of the software. It is not possible to edit this user name. The default password is [admin]. It is recommended to change this password immediately after installation.

### 4.3.2 Management of users



To open this function tap on pull-up menu ▲ next to  and select *Manage user*.

The *Manage users* window lists all the system users who have been entered and has the following functionalities:

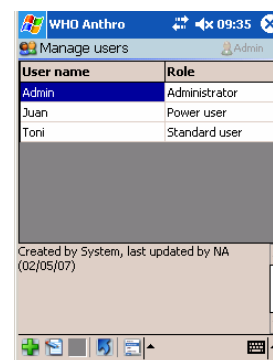
To change the information pertaining to any user, e.g. password, select the user row and tap on .

To add a new user, tap on  and enter a user name with at least 4 letters.

To go back to *Main* page, tap on .

Switching to another user requires that first a new user has been defined in addition to the Admin. Then open pull-up menu ▲ next to  and select *Log out (change user)*, or tap directly on  to open the *Login* window.

The user name of the person currently logged on appears in the top right corner.



User name	Role
Admin	Administrator
Juan	Power user
Toni	Standard user

Created by System, last updated by NA (02/05/07)

List of users

## 4.4 Settings window

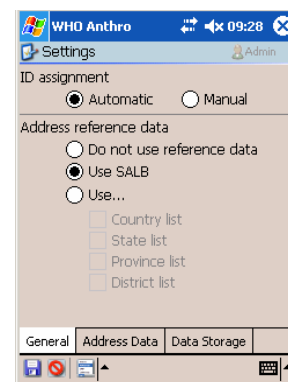
To open *Settings*, tap on  at the bottom of the Main window. The *Settings* window has 3 tab sections: *General*, *Address Data* (referring to IA) and *Data Storage* (referring to IA and NS).

In **General** the user can select:



- ID assignment: Automatic or Manual (default set to *Automatic*);. Both options refer to numerical values (maximum 2,147,483,647). In the *NS* module there are further ID assignments to be specified, see section 7.2.1.
- One of three options to enter address information: 1) not to use existing reference data, i.e. manually key in all information; 2) use available UN Second Administrative Level Boundary files (SALB); 3) use lists for country, state, province, district, as specified by the user.

Selection can be turned on or off on this page by ticking or un-ticking the respective choice.



Settings window

### Address Data

This sections enables the user to manage and tailor the address reference data. The user can specify the country where the data are collected. To use the available SALB lists for the respective country tap on to import the txt files. To upload country, province or district lists tap on . To reset to default setting tap on .

### Data Storage

By default the data generated with WHO Anthro and the error log file are stored in the internal memory and saved to “\Program Files\WHO Anthro”. This location is not safe (particularly in WM2003 devices) and data could be lost (see section 2.4.3.). Thus as long as data are stored in this location a warning symbol on the main window alerts the user. Once the user changes the default storage to a safe location (e.g. SD card, CF card, iPAQ File Store, or LOOX store) the warning symbol disappears.

Tap on to save the new settings.

To return to *Main* window without saving, tap on .

## 4.5 Toolbar menu

Tapping on the pull-up menu next to allows the user to open *Online help*, go to the *About* page, *View log* file, activate *Spinning bottle*, go *Back to start* or *Exit* the program.

*Online help* provides a concise html page with the most essential information relevant to the open window.

The *About* page shows the objective and contact details as well as the URL for the website of the WHO Child Growth Standards ([www.who.int/childgrowth](http://www.who.int/childgrowth)).

An error log file called “*WHO Anthro 2005\_ErrorLog.txt*” is created upon start-up. Should a system error occur, all relevant information will be written to this log file. As this information is important to facilitate fixing bugs, the log file should be submitted jointly with any the report of a problem (see section 8.7). The user is advised to keep the error log in the default location as it makes it easier to access when submitting a report. The *View log* options enables the user to view its content.

The *Spinning bottle* helps the user to choose a random direction when selecting another household e.g. in a survey setting (see section 7.3.).

Whereas *Back to start* takes the user to the Anthro *Main* or *Welcome* window, the *Exit* option closes the application and returns the user to the Programs window.

These toolbar options are available within all three modules and their respective windows.





## 5. Anthropometric calculator (AC)

This module facilitates deriving nutritional status results for an individual child based on the WHO standards for the indicators: weight-for-age, length/height-for-age, weight for length/height, BMI-for-age, head circumference-for-age, mid-upper arm circumference-for-age, triceps and subscapular skinfolds-for-age in z-scores and percentiles; as well as the BMI unrelated to age. The user can view the measurements on a graph using the z-score and percentile classification system. In the AC module, the user cannot save any data.

The module consists of 3 windows:


*Data-entry* where the user entered the basic data i.e. date of birth, sex, weight, height, etc.

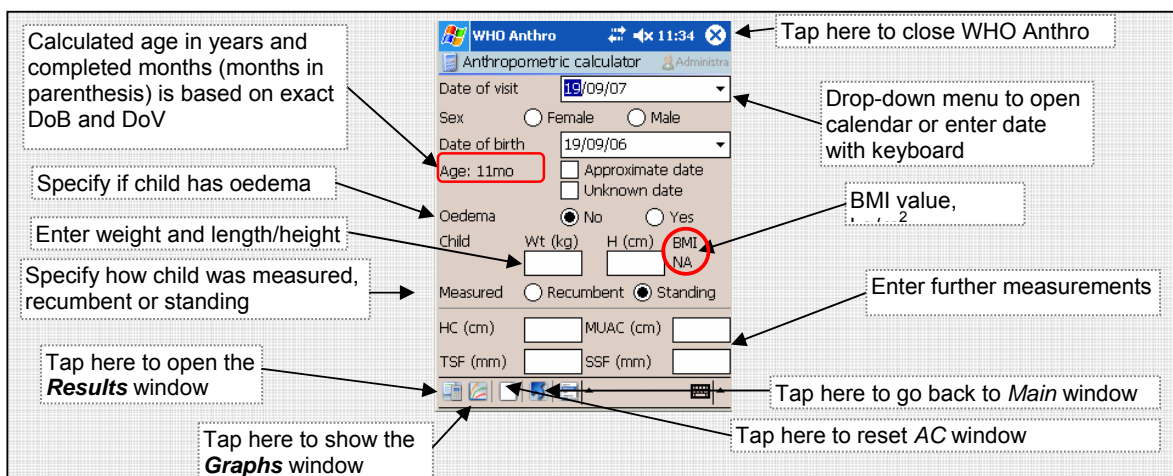
 *Results* where the user can view calculated results for all indicators in percentiles and z-scores and flags if applicable

 *Graphs* where the user can view a graphic display of the measurement compared to WHO standard curves for z-scores or percentiles

### 5.1 Data-entry window



Tapping on  in the *Main* window opens the AC data-entry window (see image below).



The screenshot shows the 'WHO Anthro' window titled 'Anthropometric calculator'. It contains the following fields and controls:

- Date of visit:** 19/09/07 (with a drop-down arrow).
- Sex:** Radio buttons for Female and Male.
- Date of birth:** 19/09/06 (with a drop-down arrow).
- Age:** 11mo (highlighted with a red box).
- Approximate date:** A checkbox.
- Unknown date:** A checkbox.
- Oedema:** Radio buttons for No (selected) and Yes.
- Child:** A label.
- Wt (kg):** An input field.
- H (cm):** An input field.
- BMI:** NA (highlighted with a red circle).
- Measured:** Radio buttons for Recumbent and Standing (selected).
- HC (cm):** An input field.
- MUAC (cm):** An input field.
- TSF (mm):** An input field.
- SSF (mm):** An input field.

Annotations with arrows point to various parts of the window:

- 'Calculated age in years and completed months (months in parenthesis) is based on exact DoB and DoV' points to the Age field.
- 'Specify if child has oedema' points to the Oedema radio buttons.
- 'Enter weight and length/height' points to the Wt and H input fields.
- 'Specify how child was measured, recumbent or standing' points to the Measured radio buttons.
- 'Tap here to open the Results window' points to the Results icon in the bottom bar.
- 'Tap here to show the Graphs window' points to the Graphs icon in the bottom bar.
- 'Tap here to close WHO Anthro' points to the close button in the top right.
- 'Drop-down menu to open calendar or enter date with keyboard' points to the Date of birth drop-down.
- 'BMI value, ...' points to the BMI field.
- 'Enter further measurements' points to the MUAC, TSF, and SSF input fields.
- 'Tap here to go back to Main window' points to the back arrow in the bottom bar.
- 'Tap here to reset AC window' points to the reset icon in the bottom bar.

Default date of visit (DoV) is set to current date and default date of birth (DoB) to a year previous to current system date. To change DoV and DoB either use drop-down arrow to open calendar and select, or overwrite using keyboard. The calendar functions are described in detail in section 3.2.3.2.

If year and month of birth are known but it is not possible to obtain the exact day of birth, tick the box next to *Approximate date*. The software then randomly selects a day within the given month and thus derives the age.

Should it be impossible to trace even the month and year of birth, tick the box *Unknown date*. If this box is ticked then only the BMI and weight-for-length/height, i.e. the age-independent indicators, will be derived. Whenever this box is ticked the displayed age reads NA.

Ideally the assessment of oedema should take place before any measurements are taken. By default oedema is set to "No". If a child is classified as having oedema the user has to tick "Yes". For details on how to assess oedema please see section 3.3.2.

Weight, length/height, head circumference, arm circumference, triceps and subscapular skinfold data are entered by tapping on the respective boxes. A numeric input panel will open allowing users to key in the measured values. The numeric input panel is described in section 3.2.2.



Body mass index (BMI) ( $\text{kg/m}^2$ ) is automatically calculated based on the entered weight and height/length (see details in section 3.3.6). If either weight or length/height are missing no BMI can be derived and NA = "Not available" will be displayed.

To specify the type of measurement, tap on either *Recumbent* (= measured lying down), meaning a length measurement, or *Standing* (= measured standing up), meaning a height measurement.

## 5.2 Results

The *Results* window shows the calculated z-scores and percentiles based on the WHO standards. The z-scores are presented with two decimals and the percentiles with one decimal.

NA stands for "not available".

NA in the z-score column means that the value for the particular indicator is outside the range of the WHO standards, e.g. if height is above 120 cm weight-for-height is NA.

If there is a valid z-score but NA in the percentile column, that means the percentile is beyond the range 0.135<sup>th</sup> – 99.865<sup>th</sup> (corresponding to -3 SD and +3 SD, respectively).

For information on calculation of percentiles and z-scores using the WHO standards please see section 3.3.7 above.

The flag column alerts the user that there are implausible values and/or uncommon measurement combinations.

Indicator	z-score	Percentile	Flag
Weight-for-length	-1.84	3.3	
Weight-for-age	-0.63	26.3	
Length-for-age	1.79	96.4	
BMI-for-age	-2.30	1.1	
HC-for-age	-1.61	5.4	
MUAC-for-age	-1.54	6.2	
TSF-for-age	-0.07	47.3	
SSF-for-age	1.16	87.7	

Valid z-scores were derived for all indicators.

Results window

For information on the default flag bounds applied to each indicator please see section 3.4.2.1 above.

The text in the bottom section of the window helps to identify potential causes in relation to the flags of the most commonly used weight- and height-based indicators.

To view the plotted measurements in relation to the WHO standard curves, tap on .

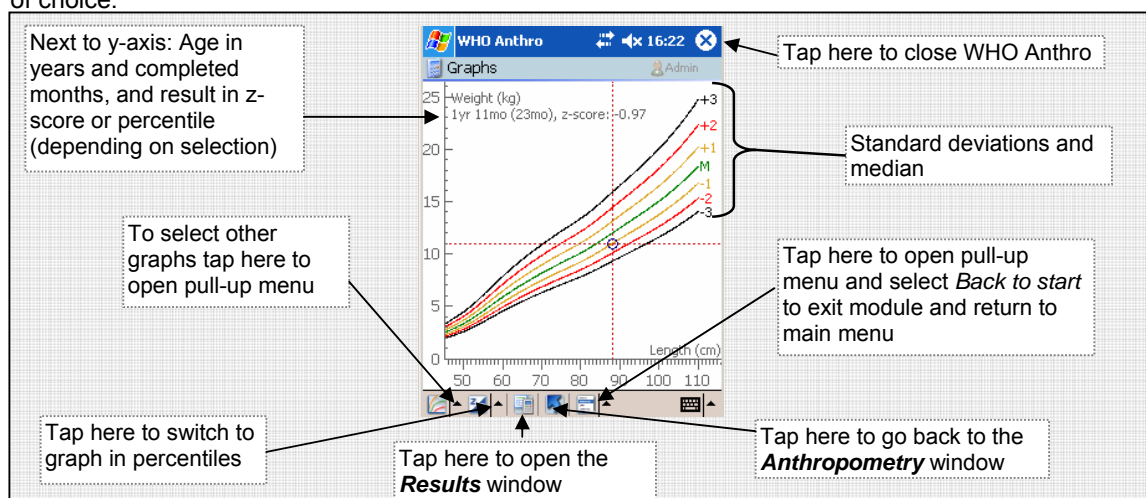
To return to data-entry page, tap on .

The toolbar pull-up menu next to opens the gateways to *Online help*, the *About* page, the *View log*, *Spinning bottle* and the options to select *Back to start* (i.e. end the module) or *Exit* the program.

## 5.3 Graphs

To open the *Graph* window, tap on . On the graphs the user can view the measurement in relation to the WHO standards by z-score and percentile classification system. If the measurement is outside of the standard range no plot is drawn.

To select the different graphs open the pull-up menu next to and tap with the stylus on the indicator of choice.








## 6. Individual assessment (IA)

The *Individual assessment* module enables the collection and saving of longitudinal data for children who are repeatedly examined from birth to 5 years of age. The collected data can comprise anthropometry and/or motor development. The child's nutritional status data can be derived and graphically displayed based on the WHO standards using the z-scores and percentile classification system. The graphical display in this module offers a view of the multiple visits to visualize trends in child growth. This module is recommended for use by pediatricians to monitor the growth of the children attending their clinics.



To open the *Individual assessment* module tap on






To directly add a record, open a record or search for a record tap on the respective icons ,  and .

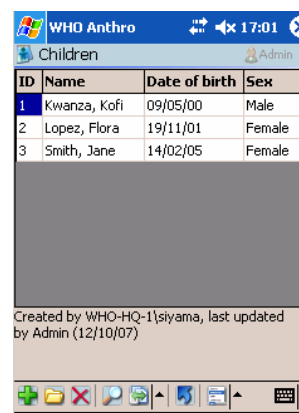
When opening the module, the active list of included children appears.

### 6.1 List of children window

The *List of children* window displays all children who have been entered and are active (not archived) in the current database. The list shows the children's ID, name, DoB and sex.

Tapping on the following buttons the user can:

-  add a new child
-  open the selected child (first select a child by tapping on the child row)
-  delete the currently selected child and all his/her visit data – a confirmation window appears before deletion is performed  
Note: Once confirmed all visit data of the child are deleted and cannot be restored.
-  search for a child in the active list based on several search criteria (name, sex, ID and date of birth), see section 6.1.1.
- From the toolbar pull-up menu next to  the user can select additional functions (see section 6.1.2)



ID	Name	Date of birth	Sex
1	Kwanza, Kofi	09/05/00	Male
2	Lopez, Flora	19/11/01	Female
3	Smith, Jane	14/02/05	Female

Created by WHO-HQ-1\siyama, last updated by Admin (12/10/07)

Active list of children

Note: At installation there are three example cases entered into the list. To avoid confusion we suggest deleting those once the user has become familiar with the software and starts entering real child visit data.

#### 6.1.1 Search function

The user can search for a child in the active list using as search criteria the child's name, sex, ID and date of birth.

##### First name and last name

The search for names is not case-sensitive and uses pattern-matching to give best possible search results. An asterisk "\*" can be used as a wildcard if the full name is unknown, e.g. entering [L\*] will find Lopez. This allows for searching for a name even if only a part of it is known, e.g. searching for \*a\* in first name will list both Flora and Jane; searching for \*an\* will only list Jane. Similarly searching for \*anz\* in family name will list only Kwanza.

##### Sex

To restrict the search by sex tap respective radio button "Female" or "Male", or if unknown select "Any".



## ID number

The user can search for any ID or specify ranges. To search for ranges enter lower and upper inclusive values. Tapping on the value boxes will automatically open the numeric input panel.

## Date of birth

The search options are: Any, Unknown or a range of dates. To restrict on DoB tick on the radio button next to *From* and select the start and end dates (inclusive at both ends). For an explanation of the date selector see section 3.2.3.2.


The program can conduct a search according to several criteria, e.g. females, with a last name starting with L\*. Once the search criteria are specified, tap the *<Search>* button.

To return to the complete list, tap on  followed by the *<Clear>* button.

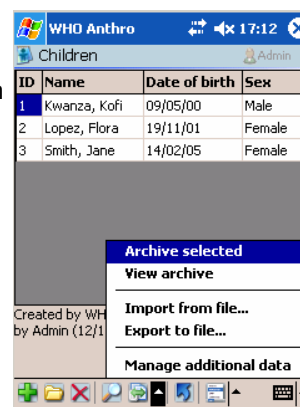
To return to the complete list without conducting a search, tap the *<Clear>* button.

If the user wants to exit the module, open toolbar pull-up menu  and select *Back to start*.

## 6.1.2 Toolbar menu


From the pull-up menu next to  to user can select the following menu functions:




- *<Archive selected>* to move a child from the active list into the archive (see section 6.1.3)
- *<View archive>* to show archived children; from that list the user can then restore a child record back into the active list (see section 6.1.3)
- *<Import from file>* to add a child record from a file (see section 8.1.1)
- *<Export to file>* to export all or selected children and their visit data to a file (see section 8.1.2)
- *<Manage additional data>* (see section 8.3)



Toolbar options

## 6.1.3 Archive function

Users can remove children's records temporarily from the active list into an archive. To archive a child, first select the record by tapping on the respective row in the *List of children* window. Then open the pull-up menu next to  and tap on *Archive selected*. The wait cursor will appear briefly before the child is sent to the archive and the active list shortened.

To restore a child from the archive, open the pull-up menu next to  and tap on *View archive*. The archive list appears showing the children who have been moved out of the active list into the archive. To restore a child first select row and then tap on . The record is moved back into the active list. To verify, tap on  which opens the active list of child records.


There is no space limit in the archive, but the user should be aware that operations may take longer to perform on this file as its size increases.


From the archive list it is not possible to open or delete a child record. To perform any of these actions users must first restore the child to the active list.



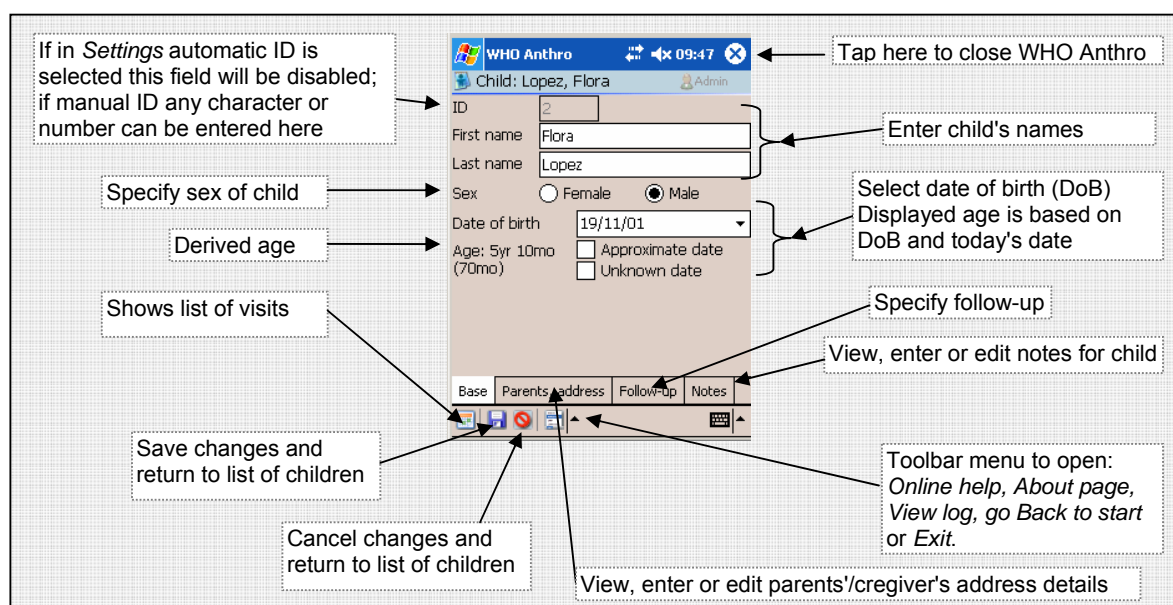


## 6.2 Child window

After selecting a child from the active list and tapping on  the *Child* window appears. Using the tab sections at the bottom the user can move through different windows to enter all relevant basic information on the child, the parents, address, follow up or other notes.

Note: Any change has to be saved in this window before returning to the list of children. It is not enough to save data in the visit window. The user always has to tap on  in the child window.

The basic data consist of name, sex and age. To derive age the user has to enter Date of visit (DoV) and date of birth (DoB). By default DoV is set to current (today's) date and DoB to a year previous to today's date. To change any date, open the calendar and select, or overwrite using the keyboard. The derived age in years and months is shown below DoB.



The screenshot shows the 'WHO Anthro' application window for a child named 'Lopez, Flora'. The window has a title bar with the application name and a close button. Below the title bar, there's a header with the child's name and a user icon. The main form contains fields for ID (2), First name (Flora), Last name (Lopez), Sex (Female/Male radio buttons), Date of birth (19/11/01), and Age (5yr 10mo (70mo)). There are checkboxes for 'Approximate date' and 'Unknown date'. At the bottom, there are tabs for 'Base', 'Parents', 'Address', 'Follow-up', and 'Notes'. A toolbar at the very bottom contains icons for saving, canceling, and other actions. Annotations with arrows point to various parts of the window: 'Tap here to close WHO Anthro' points to the close button; 'Enter child's names' points to the first and last name fields; 'Specify sex of child' points to the sex radio buttons; 'Derived age' points to the age field; 'Shows list of visits' points to the 'Follow-up' tab; 'Save changes and return to list of children' points to the save icon; 'Cancel changes and return to list of children' points to the cancel icon; 'View, enter or edit parents'/cregiver's address details' points to the 'Address' tab; 'Specify follow-up' points to the 'Follow-up' tab; 'View, enter or edit notes for child' points to the 'Notes' tab; and 'Toolbar menu to open: Online help, About page, View log, go Back to start or Exit.' points to the toolbar icons.

The toggle box "Approximate date" activates a function that randomly selects a day within the specified month and year of birth. Only if month and year are also uncertain should the user tap on the box "Unknown date". For further details on entry of *Date of birth* (DoB) see section 3.2.3. The age displayed in this window is the child's age today.

The *Child* window can be edited at any time, e.g. to enter a change of address.

### 6.2.1 ID numbers

By default ID number allocation is set to automatic, starting with the number 4 given that three example children are already entered. Note that any automatically allocated ID will only be displayed after the child record has been saved for the first time. To change to manually attributed ID numbers go to *Settings* (see section 7.2.1).



## 6.2.2 Parents, address

In the *Parents, address* section the user can enter and/or edit information on the child's parents, notes and address. These data are managed separately from child data, in order to allow users to re-use them for several children (e.g. in the same household).

To add information, tap on and to edit, tap on .

The user can collect the parents' names, their DoB, weight and height data. The age is derived similar to that of the child (see section 3.3.1). Opening the field automatically triggers the allocation of an ID for list of mothers/fathers regardless of whether any data have been entered or not. This is to indicate that the field was opened by the user.

Parental BMI ( $\text{kg/m}^2$ ) is calculated automatically when the weight and height fields have been completed.

The separate tab section *<Notes>* allows to record any additional information pertaining to the parents/caregiver of the child. Tapping on the text field automatically opens the keyboard.

To add and/or edit *Address*, tap respective icons next to this field.

The way in which the address information can be entered depends on what the user has specified in *Settings*. To enter information either tap in the address field via the keyboard or select SALB data from the drop-down menu. In a separate tab section the user can add contact details, i.e. telephone number and e-mail address. All fields are optional. For further details see section 8.4.

Parents, address window

Mother data and Notes

## 6.2.3 Follow-up

Default *Follow-up* is set to "No follow-up". It can be changed by choosing a date, time interval or place of referral.

- Date**  
 Select a specified date for follow-up using keyboard or calendar with the drop-down function.
- Interval**  
 Select a follow-up date based on predefined intervals, e.g. in 1 day, 4 weeks, 2 years, etc.
- Referred to**  
 If a child needs to be referred to another institution the user can specify this information here. The list is not exhaustive, therefore the option "Other, please specify" is available allowing users to record other referral options. A new text field opens after selecting *<Other, please specify>* to enter this information.

Follow up window

A description of how follow-up data are coded when exported is found in sections 3.4.2.3 and 3.4.2.4.




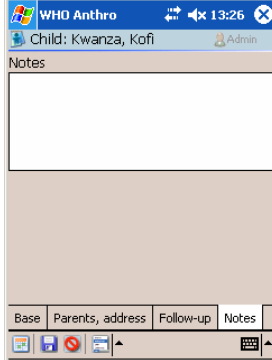


## 6.2.4 Notes

A *Notes* field is provided for including any other important information pertaining to the child in general and not just to a particular visit. These notes should present information that the user might like to consult each time when opening the child record (e.g. related to the child's birth such as low birth weight, birth order, metabolic disorders etc.).


Tapping on <Notes> opens a window with a text field. Here the user can record any important information.


To open the keyboard tap on the text field or on .




General notes on child

To edit any data, tap on the respective cell, open the keyboard, use backspace to delete existing information and enter the new one.


It is recommended to first make all changes in all 4 tab sections and then to save the new/edited information by tapping on . The program returns to the list of children.

To open the list of visits for the selected child, tap on . For a newly added child this list is empty.

To return to the list of children without saving, tap on .







Any data of the open child record has to be saved in this window before leaving it. If the user taps on  without saving, changes will be lost.

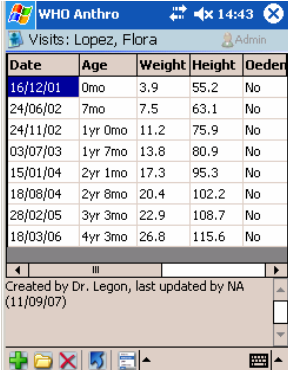
## 6.3 List of visits window

To access the list of *Visits* window the user has first to open a child record and then tap on .

The *Visits* window displays all visits pertaining to the currently selected child. If it is a new child, the list is empty. For easy reference his/her name appears on the top of the window.

From this window users can:

-  add a new visit
- tap on a visit row and then on  to open the *Visit* window
-  delete a visit entry
-  go back to the *Child* window with the tab sections: *Base*, *Parents*, *address*, *Follow-up* and *Notes*. From there, tap on  to return to the list of visits.
- select an option from the toolbar menu by tapping on the pull-up menu next to  (i.e. *Online help*, the *About* page, the *View log*, *Spinning bottle*, *Back to start* (i.e. end the module) or *Exit* the program.



Date	Age	Weight	Height	Oeder
16/12/01	0mo	3.9	55.2	No
24/06/02	7mo	7.5	63.1	No
24/11/02	1yr 0mo	11.2	75.9	No
03/07/03	1yr 7mo	13.8	80.9	No
15/01/04	2yr 1mo	17.3	95.3	No
18/08/04	2yr 8mo	20.4	102.2	No
28/02/05	3yr 3mo	22.9	108.7	No
18/03/06	4yr 3mo	26.8	115.6	No

Visits of Flora Lopez

## 6.4 Visit windows

The visit window consists of 3 tab sections: *Anthro* (short for *Anthropometry*), *Other Data* and *Motor*.

### Anthro

When adding a new visit the anthropometric data-entry window opens with empty fields for the measurements. Date of birth (DoB) appears as defined in the child's base data and cannot be changed on this screen. Date of visit (DoV) is set to today's date. To change DoV open calendar and select, or



overwrite using keyboard. The child's age is derived using the DoB and DoV. To enter the raw measurements tap on the relevant field to open the numeric pad. It is mandatory to specify if the child has oedema and how height was measured, i.e. in recumbent position or standing.


### Other Data

Other data can comprise any notes relevant to this visit, e.g. illness, restlessness, breastfeeding status etc. and any extra data created via the *Manage additional data* option.

### Motor

The 6 gross motor milestones may be assessed in children 3-24 months. Each milestone has detailed criteria that the user has to observe and tick. Only when all criteria for a milestone have been ticked is the milestone classified as achieved. Colour codes below each milestone provide a quick overview of the child's current motor development status. An "achieved" milestone can be reset to "unachieved" at a later visit.

### Editing saved data

Child visits that have been saved may be re-opened to edit anthropometry, motor development and other data. To edit measurements tap on the respective field, clear the entry and then enter the new data. To edit a date field tap on the drop-down menu to open the calendar or use keyboard to overwrite the existing date. To edit any text fields use the stylus to highlight the word, use backspace on the keyboard to erase the entry and then enter the new text and tap on  to save the entries (see also step by step example, section 9.1.2).

Note: DoV cannot be edited. To change/correct DoV, all data have to be re-entered with the corrected date and the faulty record deleted from the list of visits.

## 6.4.1 Anthropometry

The top of the *Anthro* window shows the child's name and DoV for easy reference. In this window users can enter and edit the child's measurements, specify how length/height was measured and if the child has oedema (see figure below).

The screenshot shows the WHO Anthro application interface. The top bar displays the child's name and Date of Visit (DoV): Lopez, Flora - 24/11/02. Below this, there are fields for Date of visit, Date of birth, and Oedema status. The main section contains fields for Weight (Wt), Height (H), BMI, Head Circumference (HC), MUAC, TSF, and SSF. At the bottom, there are tabs for Anthro, Other Data, and Motor. Annotations point to various elements:

- Child's name and DoV
- Specify whether a child has oedema, default = No
- Enter child's weight and length/height values and how s/he was measured recumbent or standing
- Fields to enter additional measurements
- Tap here to open the **Results** window
- Tap here to open the **Graphs** window
- Tap here to save and return to list of **Visits** window
- Tap here to close WHO Anthro
- Calculated age with completed months in parenthesis based on the entry of exact DoB and DoV
- BMI kg/m<sup>2</sup>
- Tap here to open the **Other data** window
- Tap here to open the **Motor milestones** window
- Tap here to open toolbar menu
- Tap here to cancel and return to list of **Visits** window

If entering a new visit, users can select a *Date of visit* (DoV) by using the date input field (by default set to today i.e. the current system date). The *Date of birth* (DoB) is carried over from the *Child* window and the derived age is displayed in years and months and completed months in the next row.

Specify whether the child has oedema or not and tap on the respective radio button.




Enter weight and length/height data with maximum 2 decimals. Tap on the respective data fields to open the numeric input panel and key in the measurement values. For details on the numeric input panel see section 3.2.2. If data are beyond the valid range (see 3.3.3) the field returns to blank.

Specify how the child was measured and tap either the radio button next to *Recumbent* = measured lying down, meaning a length measurement was taken, or next to *Standing* = measured standing, meaning a height measurement was taken.

The *BMI* ( $\text{kg/m}^2$ ) is automatically calculated based on the entered weight and height/length data. No BMI can be derived if the user has specified *Yes* for *Oedema* or if weight or height/length data are missing. In those cases the *BMI* field says *NA* (i.e. not available). For details on BMI see section 3.3.6.

Enter other measurement data with maximum 2 decimals for head circumference (HC), mid upper arm circumference (MUAC), triceps skinfold (TSF) and subscapular skinfold (SFF) if available. If values are beyond the valid range (see section 3.3.3) the field returns to blank.

## 6.4.2 Results

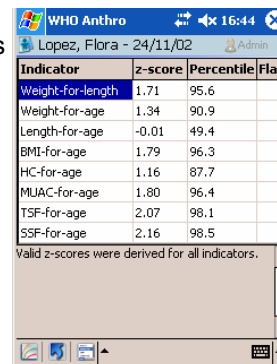
Tap on  to open the *Results* window. For easy reference it shows the child's name and DoV on top.

To the right of each indicator appear the z-score with 2 decimals and percentile value with one decimal based on the WHO standards.

NA in the z-score column means that the value for the particular indicator is outside the range of the WHO standard (e.g. age older than 60 months) or some essential data (e.g. age) might be missing. If the child has oedema all weight based indicators will display "NA".

NA in the percentile column can mean that the corresponding z-score is NA, but also that the z-score value is above 3 SD or below -3 SD (i.e. beyond the percentile range 0.135 to 99.865).

For information on calculation of percentiles and z-scores using the WHO standards please refer to section 3.3.7 above.






Indicator	z-score	Percentile	Flag
Weight-for-length	1.71	95.6	
Weight-for-age	1.34	90.9	
Length-for-age	-0.01	49.4	
BMI-for-age	1.79	96.3	
HC-for-age	1.16	87.7	
MUAC-for-age	1.80	96.4	
TSF-for-age	2.07	98.1	
SFF-for-age	2.16	98.5	

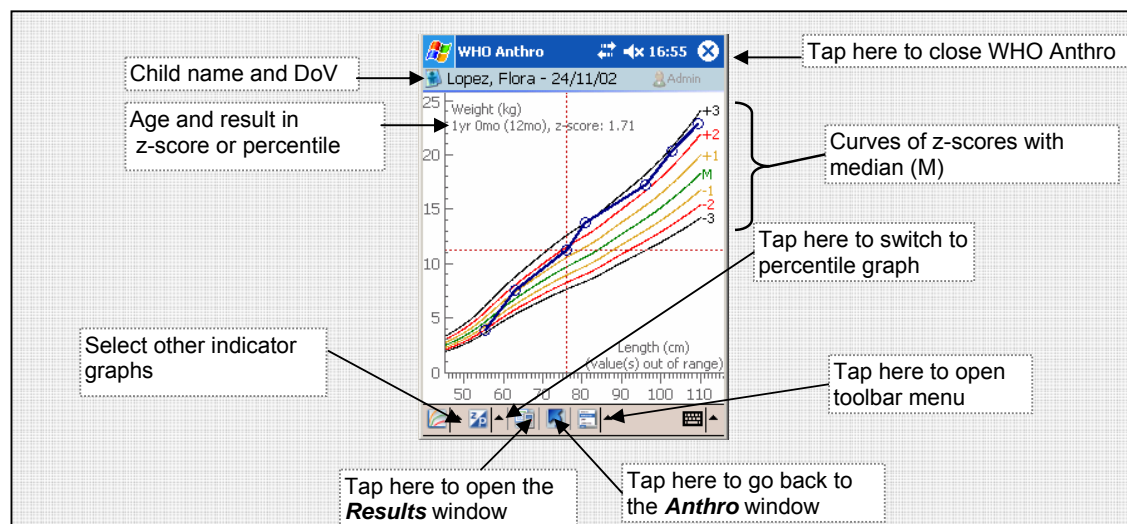
Valid z-scores were derived for all indicators.

Results window

## 6.4.3 Graphs

Tap  to open the *Graph* window. By default it opens the weight-for-length/height graph as this indicator is top of the list in the *Results* window. The graphs display measurements in relation to the WHO standards for each indicator. To view another indicator graph the user has to open the pull-up menu by tapping on  next to  and select with the stylus.

The graph function plots z-scores and percentiles. The age and result for the child at the current visit is displayed on top next to the y-axis.





In the *IA* module the graph will display all valid visits/points within the plotting range of the graph.

The graph pertaining to *<Motor>* shows the windows of achievement for the six motor milestones and is explained below.

#### 6.4.4 Other data

In this tab section the user can enter additional data variables pre-defined in *Manage additional data* (see section 8.3.).

**Note:** These data variables cannot be collected for any records that were already saved to the database at the time when the user defined the additional data.

In order to collect consistent information it is thus important to define beforehand what additional data are relevant to collect. Given that the additional data will add to the size of the database, users are advised to keep additional data variables to the minimum necessary.

The image to the right shows a comments field to enter interpretation of results. To see how to create additional data see section 8.3. How to collect these data is shown in step by step examples in section 9.

The collected additional data are exported as one column in simple xml format.

Any additional variables and sections always appear in the language in which they were defined, i.e. they are not translated.

Collection of additional data

#### 6.4.5 Motor

This function enables the user to collect data on a child's motor development together with or independently of anthropometric data. For background information on Motor milestones (MM) see section 1.4.

Tapping on *<Motor>* opens the *Motor milestones overview* window with the images of 6 gross motor milestones. On top, for easy reference, appears the child's name and DoV.

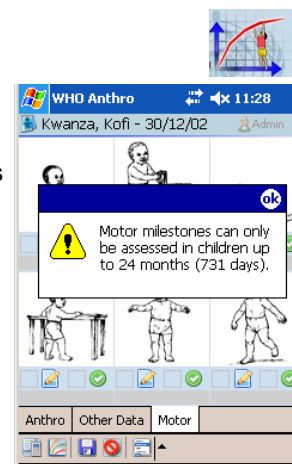
The MM's sequence is from left to right. To open a MM tick and then . Each milestone has detailed criteria that the user has to observe and tick. Only when all criteria for a milestone have been ticked is the milestone classified as achieved. If one or several criteria cannot be observed the user has to tap on to continue.

Motor milestones overview

Given that the child is being assessed over time at several visits, and assessment errors may be detected, an "achieved" milestone can be reset to "unachieved" at a later visit by un-ticking .

The assessment of motor development is recommended for children 3-24 months of age. The software has thus been programmed to accept only children up to 24 months (731 days). If the user taps <Motor> and the child is beyond that age limit, a pop-up window with a warning message appears (see image on the right).

In order to continue, tap <ok>. All fields are inactive as no MM data can be collected for children older than 24 months.



#### 6.4.5.1 Motor milestone status and colours


Colour codes below each milestone provide a quick overview on the child's current motor development status. The colour scheme is as follows:

Grey	Not assessed
Blue	Assessed but not observed and child's age below or within milestone window
Red	Assessed but not observed and child's age above milestone window
Green	Assessed and observed, and child's age below or within milestone window
Lime	Assessed and observed, but child's age above milestone window (or a former "Red")
Rose	Not assessed and a former "Red"

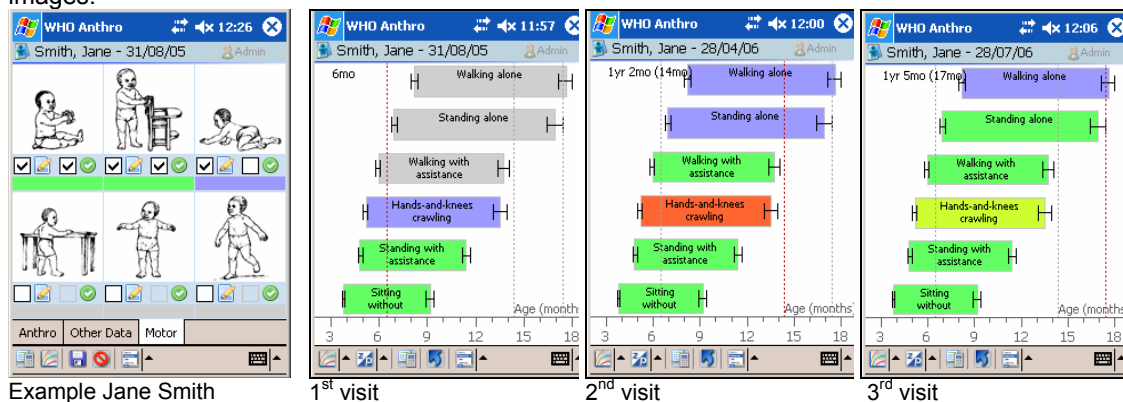
The colour codes "lime" and "rose" can never apply at a child's first motor development assessment. For example, if a child at his/her first visit can perform all criteria of a given milestone, but his/her age is above the upper limit the window colour will turn green rather than lime. This is to reflect the assumption that the child probably achieved the milestone within the window. Rose only applies when a child has had a previous assessment that recorded inability to perform the milestone when the child's age was outside the milestone's window of achievement.

Note: Some MDs do not correctly display background colours, on these devices the colouring displayed in the sample images may not appear in the same way. Please consult your MD manual.

#### 6.4.5.2 Motor milestones overview and graph

After each visit users can summarize the child's achievement status of the six motor milestones graphically by tapping on .

The windows of achievement graph presents broad bands, 5 to 10 months wide, representing normal variation in the achievement of those milestones among healthy children. The bands are colour-coded to visualize the child's achievement status. The dotted lines towards the x-axis mark the age when the visits took place, with the red line marking the currently open visit. When opening the sequence of the 3 visits of the example child Jane Smith and looking at the MM graph the user will see the following images.





Note: The x-axis on the graph goes only up to 18 months – which is beyond the upper-most confidence bound of the last MM – but the display functions for children up to 24 months.

## 7. Nutritional survey (NS)




This module facilitates:

- Collecting new nutritional and/or motor development data based on a sample of children (one record per child)
- Deriving and displaying results using z-scores and percentiles based on WHO standards
- Editing existing surveys
- Importing/exporting survey data files in \*.txt, \*.csv or \*.xml formats

The NS has the following differences compared to the IA module







- A child can only have one assessment of growth and/or development
- The user can also record data on: Cluster, Household and Team
- The motor milestone assessment has the option to collect "reported as achieved" milestones in addition to "assessed and observed" (given that there is only one visit this allows for collection of reported and recalled data)
- A *Survey settings* window exists for documenting survey-specific settings
- A *List of surveys* window lists all surveys created on the mobile device

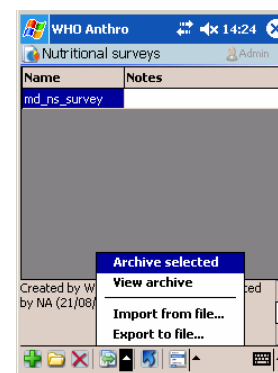


From the *Main* or *Welcome* window open the NS, by tapping on  or use the shortcuts and tap on  to add a new or  to open an existing survey.

### 7.1 List of surveys window

When a user opens this module the *List of surveys* window appears showing a table with 2 columns. Each row pertains to one survey. The first column contains the survey *Name* and the second column *Notes*. Functions related to surveys can be activated by tapping on the icons at the bottom:

-  to add a new survey
-  to open the selected survey
-  to delete the selected survey
- Open the pull-up menu next to  in order to: *Archive selected*, *View archive*, *Import from file* or *Export to file*.
-  to go back to *Main* window
- Open toolbar menu next to  and select: *Online help*, *About*, *View log*, *Spinning bottle*, *Back to start* or *Exit*.





Menu functions

Note: When the user chooses to delete a survey a warning message will pop up that s/he needs to confirm. Once a survey has been deleted it cannot be recovered!


- To archive a survey: Tap first on respective survey row and then on *Archive selected*.





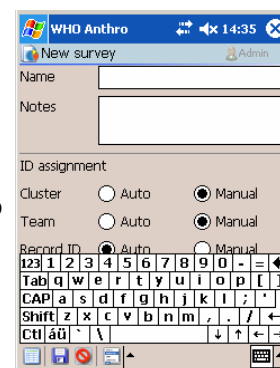
- To retrieve a survey from archive: Go to *View archive*, select survey and then tap on . The survey name will disappear from the archive list. Tap on  to return to list of active surveys which contains the retrieved survey.
- To import a survey: Select *Import from file* and specify *Folder* and *Type*, i.e. \*.txt, \*.csv and \*.xml; a list appears with surveys with the specified file extensions. Tapping on a survey name starts the import process. When the import is completed, the program returns the user to the list of active surveys (see also section 8.1.1).
- To export survey to a file: Select survey and tap *Export to file*. Surveys can be exported to files in \*.txt, \*.csv and \*.xml format (see also section 8.1.2).

## 7.2 New survey

Tapping on  to add a survey opens an empty window with the title *New survey*. In that window the user has to provide a name (mandatory) and can add descriptive notes. The name and notes entered will then appear in the list of surveys window. As these are text fields the keyboard opens automatically.





In the *NS* module, IDs can be assigned to every child record, the household, the data collection team and the cluster. By default the *ID assignment* is set to auto for record and household ID, and to manual for cluster and team. To change these default selections, tick the respective radio buttons.

To include other data variables in the data collection tap on the *<Manage additional data>* button (see section 8.3.)



New survey window

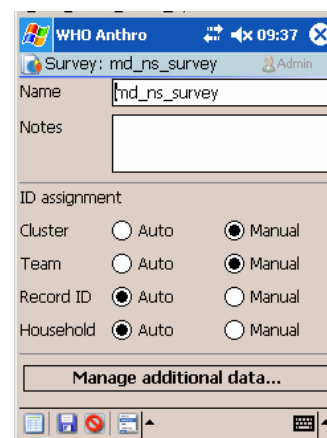
Other functions available are:

-  go to list of child records
-  save entered information
-  cancel and return to the list of surveys
- Open toolbar menu next to  and select: *Online help*, *About*, *View log*, *Spinning bottle*, *Back to start* or *Exit*.

### 7.2.1 ID assignment

Each survey has an independent ID count, meaning that the ID numbers of children in a survey always start at 1. By default, a new survey has automatic ID assignment for child records and household, and manual ID assignment for cluster and team.

Manual child ID assignment allows for entering any number as a child ID. Uniqueness of manual ID assignment is not enforced, meaning that two or more child records can be given the same ID.








ID assignment in NS module

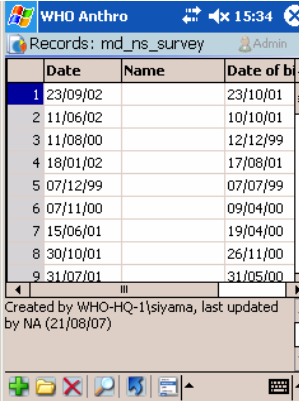


## 7.2.2 List of records

When a survey is opened, all child records in this survey appear in a scrollable spreadsheet with the columns: Date (of visit), name, date of birth and sex. The text below the spreadsheet specifies who created the file, who last updated it and when.

The available functions are:


-  add a child record
-  open selected child record
-  delete selected child record
-  search for child records
-  go back to survey window



	Date	Name	Date of b
1	23/09/02		23/10/01
2	11/06/02		10/10/01
3	11/08/00		12/12/99
4	18/01/02		17/08/01
5	07/12/99		07/07/99
6	07/11/00		09/04/00
7	15/06/01		19/04/00
8	30/10/01		26/11/00
9	31/07/01		31/05/00

Created by WHO-HQ-1\siyama, last updated by NA (21/08/07)

Records' window

Tap on  to go to the *About* page, *View log*, activate *Spinning bottle*, go *Back to start* or *Exit* the program.

## 7.2.3 Search for child record

The user can search for a child record in the open survey using as search criteria the child's name, sex, date of visit and cluster.

### First name and last name

The search for names is not case-sensitive and uses pattern-matching to give best possible search results. An asterisk "\*" can be used as a wildcard if the full name is unknown, e.g. entering [L\*] will find Lopez. This allows for searching for a name even if only a part of it is known, e.g. searching for \*a\* in first name will list both Flora and Jane; searching for \*an\* will only list Jane. Similarly searching for \*anz\* in family name will list only Kwanza.

### Sex

To restrict the search by sex tap respective radio button "Female" or "Male", or if unknown select "Any".

### Date of visit

The search options are: *Any* or a range of dates. To restrict on DoV tick on the radio button next to *From* and then enter the start and end dates (inclusive at both ends). For an explanation of the date selector see section 3.2.3.2.

### Cluster

The user can search for any cluster number or specify ranges. To search for ranges enter lower and upper inclusive values. Tapping on the value boxes will automatically open the numeric input panel.

The program can conduct a search according to several criteria, e.g. females, with a last name starting with L\*. Once the search criteria are specified, tap on the <Search> button.

To return to the list of records, tap on  followed by the <Clear> button.

To return without conducting a search, tap on the <Clear> button.

If the user wants to exit the module, open the toolbar pull-up menu  and select *Back to start*.

## 7.2.4 Child record

A child record consists of 4 tab sections: *Reference*, *Anthro*, *Other Data* and *Motor*. To open, tap on the respective button just above the menu icons.






#### 7.2.4.1 Reference

Date of visit (DoV) is by default set to today's date. To change date either use drop-down arrow to open calendar and select, or overwrite using keyboard. To enter names use the keyboard or other selected data-entry mode. Depending on whether automatic or manual ID assignment has been selected the respective fields are either disabled or activated. In case of automatic assignment the attribution of ID numbering happens automatically and IDs appear when a record has been saved. If needed, the Cluster and Team fields can also be used for entering, e.g. regions or urban/rural.

The default weighting factor for each record is set to "1". To change this value tap on the field to open numeric pad, tap <C> to clear and then enter the new value. Sampling weight can have up to 16 decimals. They are not all visible due to limited field space on screen but are exported in full length.

Reference tab

#### 7.2.4.2 Anthro

This tab section is similar to the one in the AC and IA modules (see section 5.1 and 6.4.1). The user has to specify the child's sex. Date of birth (DoB) is by default set to a year before the current (today's) date. To change DoB either tap on drop-down arrow to open calendar or overwrite using keyboard. The toggle box "Approximate date" activates a function that randomly selects a day within the specified month and year of birth. Only if month and year are also uncertain should the user tap on the box "Unknown date". The user has to specify if child has oedema or not (default set to "No"), enter the measurement results and specify how height was measured, i.e. recumbent or standing. If no other data will be entered, tap on  and return to the list of records.

Anthro tab

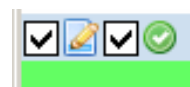
#### 7.2.4.3 Other Data

In this section the user can save notes and collect previously specified additional data variables (see section 8.3.).

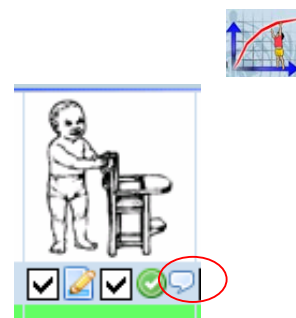
#### 7.2.4.4 Motor

The 6 gross motor milestones may be assessed in children 3-24 months. Given that the observer only sees the child once, the data-collection is slightly different to that in the IA module (see section 6.4.5).

- The recommended sequence is to start by assessing MM 6, *Walking alone*. If the child fulfils all the criteria for *Walking alone*, the software is programmed to assume that all earlier milestones have also been achieved and they do not need to be assessed.
- In the NS module the user can also accept achievement of MM based on recall information by the caregiver. If all criteria for a MM are reported by the parent or caregiver the user taps the respective boxes for each criterion, and a pop-up window will ask the user whether this information was reported. Tap <Yes> on the pop-up window (see image on the right).
- If the child cannot walk alone (and the parent or caretaker does not report it) the user should proceed to assess MM 1, 2, 3, 4 and 5.



- If an MM was reported as achieved by the parent or caregiver, i.e. not observed at the time of the assessment, a callout symbol is added to the image in the overview window. This achievement status is classified as "reported" and coded accordingly when exported (see section 3.4.2.2).



To open each motor milestone (MM) tick and then . Each milestone has detailed criteria that the user has either to observe or to obtain information on achievement as reported by caregiver.

Tap on to open the windows of achievement. To go back to MM overview, tap on .

The colour scheme in the *Nutritional survey* module is as follows:

Grey	Not assessed/reported
Blue	Assessed but not observed and child's age below or within milestone window.
Red	Assessed but not observed and child's age above milestone window
Green	Assessed and observed or reported as achieved and child's age below or within milestone window

Given that "milestone not achieved" means the same whether observed or reported, the respective codes have been combined.

Child records that have been saved can be re-opened to edit their reference, anthropometric, other or motor development data. To edit measurements tap on the respective field, clear the entry and then enter new data. To edit other data containing a date field tap on the drop-down arrow to open the calendar or use the keyboard to overwrite the existing date. To edit any text fields use the stylus to highlight the word, use backspace on the keyboard to erase the entry and then enter the new text.

Tap on to save the child data and return to the *NS* records screen.

Tap on to go back to the list of child records without saving

## 7.3 Spinning bottle

The *Spinning bottle* is a random direction pointer tool that can be used to ensure random choice of directions when collecting data in a field survey. This is to offer an alternative to using bottles on the ground (which are not always available, or show non-random behaviour because of shape).

To access this function open the pull-up toolbar menu and select *Spinning bottle*. To start tap on the window and wait until the dial stops again. The direction in which the dial points is the one to follow. Of course the user has to first decide in what position to hold the MD and not move after the spinning stops.

To close the *Spinning bottle*, tap on .



Spinning bottle window

## 8. Other functions

### 8.1 Import from file and Export to file

In the *IA* and *NS* modules the user can import from and export to the following three file formats: Comma-separated values (csv), text (txt) and extensible mark-up language (xml).

### 8.1.1 Import



The exported *IA* data file without results contains all basic data including notes and defined additional data, the raw data and motor development assessment (see Annex 1). Each row represents one visit.

The exported *NS* data file contains all basic data including notes and defined additional data, the raw data and motor development assessment (see Annex 1). Each row represents one record.

The exported file is now stored on the mobile device database or a memory card, depending on the choices made in the *Save As* window.

**Note:** The exported child record in the *IA* and the exported survey in the *NS* remain on the list. i.e. are not deleted.

For details on variables and coding in the exported file please see Annex 1.

The fields *LastUpdatedBy* and *LastUpdatedAt* are set to the current user and system time when importing the file.

For instructions on how to copy this file to the desktop please see section 8.2.2 below.

## 8.2 Copying and moving data

The user may want to copy the data from the mobile device to a PC for further analysis and storage. There might also be a need to copy data between two locations on the mobile device itself or to a memory card.

To move or copy data between a PC and mobile device the following three options are described:

1. Using ActiveSync file synchronization
2. Using Windows Explorer on the PC
3. Using a memory card

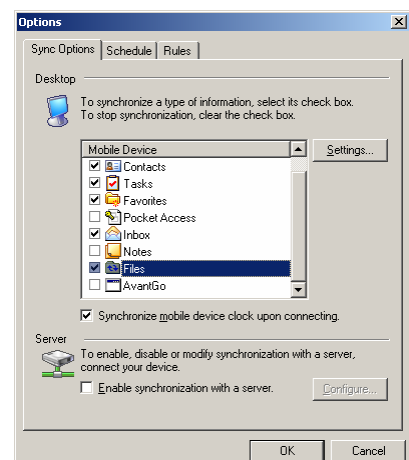
Methods 1 and 2 assume that ActiveSync is installed and the PC and MD are connected, i.e. a partnership is established (for details and other options see manual of the mobile device).

### 8.2.1 Copy using ActiveSync file synchronization

ActiveSync includes functions for automatically synchronizing the \My Documents\ folder on the mobile device with a folder on the PC. The file synchronization works both ways, enabling file movements between designated folders from the PC to MD and back.

This can be set up in the following way:

- Open ActiveSync on the PC
- <Start → Programs → ActiveSync> or
- Right click the ActiveSync icon on the taskbar and select *Open Microsoft ActiveSync*
- Click on <Options>
- In the list of Sync Options tick <Files>
- Click <OK> to finish
- A folder will now be created in the My Documents folder of the PC
- This folder will be named the same as the mobile device name given when a partnership was setup between the mobile device and PC. For details on partnerships please refer to the MD manual.



Options window of PC ActiveSync

**To copy the data follow the steps:**

- Following the procedure for copy/move files on the mobile device, copy the files to the "Mobile Device\My Pocket PC\My Documents\" folder on the mobile device.



- Open My Documents on the PC and navigate to the sync folder with the same name as the mobile device (e.g. PocketPC or whatever the name given when the partnership was set up between the mobile device and the PC).
- The files should now be automatically listed in that window. If nothing appears check that ActiveSync is activated, alternatively press F5 to refresh the folder listing in Windows Explorer.

### 8.2.2 Copy using Windows Explorer on the PC

To copy files use Windows Explorer on the PC:

- Open ActiveSync on the PC
- <Start → Programs → ActiveSync> or
- Right click on the ActiveSync icon on the taskbar and select *Open Microsoft ActiveSync*
- Click on <Explore>
- In this window the user can copy or move the files on the MD as if it were a disk drive on the PC

Clicking on <My Mobile Device> will allow navigation in all other folders on the mobile device but not the \My Documents\ folder.

Alternatively access to the mobile device can be established through the PC:

- Open Windows Explorer
- <Start → Programs → Windows Explorer > or
- <Start → My Computer → My Documents>
- Click on <Folders> to display folders list
- Expand the <My Computer> node
- Click on <Mobile Device> (which displays the same as described above)

### 8.2.3 Copy using a memory card

On the mobile device copy the data to a memory card and then insert it into a memory card reader connected to the PC. Use Windows Explorer to copy the data. This method is similar to using a floppy disk or a memory stick on a PC.

### 8.2.4 Move files on the mobile device and memory cards

To move (or copy) data between two locations on the mobile device or a memory card connected to it the following procedure applies:

- On the mobile device <Start → Programs → File Explorer>
- Select the source folder to use
- Click on a folder to view the contents
- To move one level up use the drop-down list on top of the window
- Select the file(s) to move or copy
- For a single file, tap row
- Multiple files, tap and drag to select multiple rows
- To select all use < → Edit → Select All>
- Tap and hold on one of the selected files until a pop-up menu opens
- Select <Cut> to move
- Select <Copy> to copy



- Navigate to the destination folder
- Using the scrollbar move to the bottom of the list
- Tap and hold on the empty area on the bottom of the list
- Select <Paste> to start the copy process
- If files with the same names exist a warning message will be displayed

The same can also be achieved by using a PC to which the mobile device is connected. The procedure for that is the same as above except that users copy/move the files within the mobile device using the windows explorer of the PC to which the mobile device is connected. See above for instructions.

### 8.3 Manage additional data

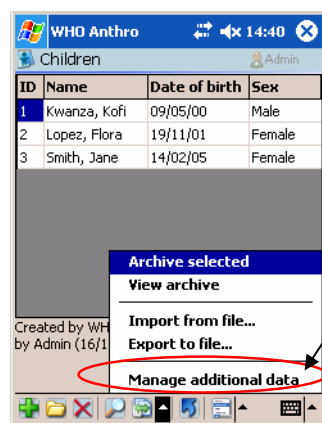
The *Manage additional data* function can be used for a small questionnaire design to add important data to the child growth and development information. This function is available in the *IA* and the *NS* modules.

The additional data function enables the user to collect visit-specific, semi-structured data, e.g. if the child has diarrhoea, his/her vaccination status, specific micronutrient deficiencies, whether s/he is receiving food aid or necessary follow-up action, etc.

The additional data can consist of several sections (topics, e.g. feeding, sanitation, and treatment). Each section can contain any number of variables, and the format can be text, numeric or date.

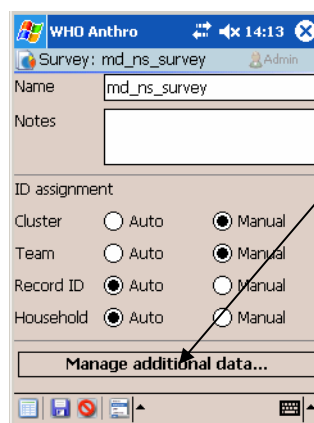
The function works similarly in both modules, only the starting points are different (see images below):

**IA: List of children window**



Open pull-up menu next to and select *Manage additional data*.

**NS: Survey window.**



Tap on button <Manage additional data>

To add a new section, tap on pull-up menu next to and select *New section*.

To add a new variable tap pull-up menu next to and select *New variable in current section*. To add a new variable it is mandatory to first create a section.



*Manage additional data*



When adding a new section (see image on the right), enter a short identifier (maximum 50 characters) into the ID field. This ID can be explained in more detail in the description field (maximum 250 characters).

To edit an existing section, tap on the ID and description field and this will open the keyboard.

Users should be aware that any change (e.g. edits/additions/deletions of sections) will be available only for subsequent data entries and not for the already existing data records in the database.

After creating sections and variables, save changes by tapping on . This will automatically close the window.

To return without saving the changes made, tap on .

The newly created additional data sections and variables (see image on the right) will be available when entering data for new child visits and new surveys.

To edit an existing additional data section or variable, tap on the identifier to select and then tap on .

To delete an existing additional data section or variable, tap on the identifier to select and then tap on . A warning message will pop up asking the user to confirm the action. Note that when a section is deleted all variables defined within that section are also deleted. However, previously collected data will be retained and must be deleted manually in each visit where this section has been used. This is to avoid accidental deletion of valuable data.

To return to the list of children or survey window, tap on .

To close the module, open toolbar pull-up menu and select *Back to start*.

A step by step example for managing additional data and collecting such information can be found in section 9.1.3.

*Additional data section*

**Note:** Variable names containing table delimiter characters like tabulator, comma or semicolon can corrupt data tables when exported to other formats than xml. Therefore it is recommended to create self-explanatory variable names with underscores (if needed) but without blanks, commas or semicolons.

If a core variable already exists with a given name, an additional data variable with the same name will not be exported. Therefore the user is advised to always create unique new variable names. For list of core variables see section 3.4.1.



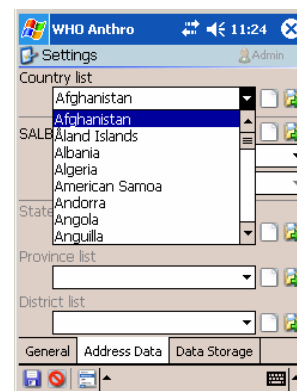


## 8.4 Address Data

The *IA* module facilitates the collection of detailed address data for each child. Before going to the *IA* the user has to specify in the Settings how s/he wants to collect the address information (see section 4.4.). In the General tab section the user can choose to not use the reference data (default setting), to use the Second Administrative Level Boundaries (SALB) datasets, or to apply user defined country, state, province and district lists.

A comprehensive *Country list* (including territories such as small islands that have no country status) comes with the installation. From this list the user can select a country/territory by tapping on the drop-down menu <▼> and scroll through the list to specify a country.



If the user chooses to not use any reference data s/he can use the country list and type in whatever information is deemed important.



Address Data section

### 8.4.1.1 Country list

The *Country list* comes with ISO ALPHA-3 letter codes (not displayed) which are based on the United Nations Standard Country or Area Codes found at: <http://unstats.un.org/unsd/methods/m49/m49.htm>.

In order to reset and replace this list tap on  and then  to import the revised file. It is important when replacing or changing the country list to maintain its file structure, i.e. 1<sup>st</sup> column ISO ALPHA-3 code and 2<sup>nd</sup> column country name.

**Note:** No empty fields allowed.

### 8.4.1.2 SALB data

After selecting SALB, the user has to open the *Address Data* tab for further actions. First s/he has to specify the country where s/he will collect the data and then import the respective SALB data files with the administrative levels 1 and 2.

The SALB data are boundary files that are provided for the first and the second sub-national administrative level of a country. These datasets form part of the UN geographic database and can be downloaded from [http://www3.who.int/whosis/gis/salb/salb\\_home.htm](http://www3.who.int/whosis/gis/salb/salb_home.htm). Predefined SALB lists are available for most countries.

The meaning of SALB levels 1 and 2 depends on the internal structure and size of the country e.g. in Switzerland it has a different meaning than in Brazil (for further information, see [http://www3.who.int/whosis/gis/salb/salb\\_home.htm](http://www3.who.int/whosis/gis/salb/salb_home.htm)).

To add or update a country's SALB file, the user has to download and convert the SALB Excel file to a tab delimited text file before uploading it to the MD.

The steps to prepare the SALB files for import to the MD are as follows:

On the PC go to [http://www.who.int/whosis/database/gis/salb/salb\\_coding.htm#DATA%20DOWNLOAD](http://www.who.int/whosis/database/gis/salb/salb_coding.htm#DATA%20DOWNLOAD).

- Select the country and year version of the SALB file to be imported, download and save
- Open the file in Excel
- Delete all header and footer rows so that the file contains only the following columns: 1st administrative level names, 1st administrative level codes, 2nd administrative level names and 2nd administrative level codes.

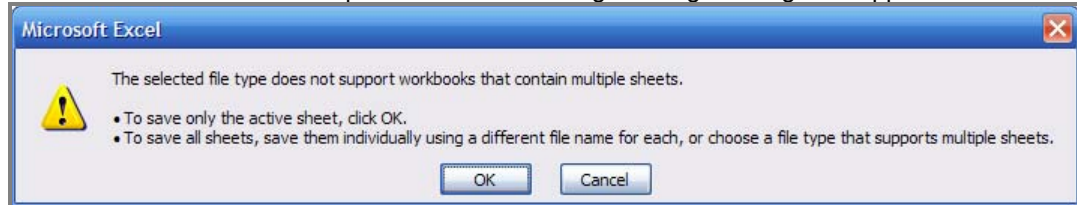
**Note:** No empty fields allowed.

- In Excel go to < → *File* → *Save As*> and select: "Text (tab delimited) (\*.txt)"

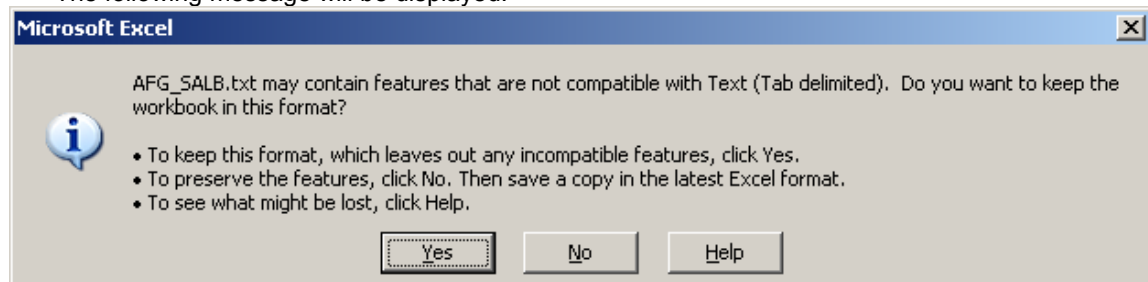




- In case the Excel file has multiple sheets the following warning message will appear:




- Select <OK>
- The following message will be displayed:



- Select <Yes>
- Copy the created file to the \My Documents\ folder on the mobile device (see instructions on copying a file in section 8.2)

#### On the mobile device


- Tap on  and select the new SALB country txt file to import
- The file will be automatically added to the MD system

Note the sequence of these steps: 1) prepare the file on the PC; 2) copy it to the MD; 3) import file.

When SALB data collection has been specified in Settings, the user may still collect other address and contact information, i.e. postal code, phone number, e-mail, etc.

#### 8.4.1.3 Removing SALB data

The steps for removing SALB data are as follows:

- Tap on  to reset
- Tap <Yes> to confirm

Note: When reset is confirmed, all currently imported SALB files will be deleted.

The SALB codes can be used for further stratified analysis and mapping of the collected data according to the country's administrative structure.

#### 8.4.1.4 State, province and district lists

State, province and district lists can be tailored to meet user-specific needs and facilitate the collection of address information according to specific administrative or geographic settings, e.g. local administrative structures and codes. This is also helpful for the collection of address data in countries that do not yet have SALB data files.

In *Settings* the user can specify which lists to use and upload those for use in the *IA* module.

To construct these \*.txt files follow the formats outlined below.

##### States

All lines in the file used for loading/updating states should follow this format:

<Name>¶



Note: No empty fields allowed.

### Provinces

All lines in the file used for loading/updating provinces should follow this format:

<Name>¶

Note: No empty fields allowed.

### Districts

All lines in the file used for loading/updating districts should follow this format:

<Name>¶

Note: No empty fields allowed.

### Rules for importing address reference data

When a given item (e.g. country) appears more than once in the imported file, the first occurrence is taken into account and subsequent ones are ignored. Items are identified by their ID fields, i.e. ISO-3 code for countries, level 1 or level 2 code for SALB data (this rule does not apply to states, provinces and districts as they only have one field).

Imported SALB files can only contain data for one country (i.e. SALB data for more than one country must be loaded from distinct files).

Note: Changes made to these lists will be applied after the WHO Anthro has been closed and restarted.

## 8.4.2 Child address

To enter the address open the *IA* child window and tap on section button <Parents, address>.

Tap on  next to the address field to add a new address.

The *Child address* window enables users to collect contact details of the child. It is accessed from the *Child info* window by tapping <Address>.

The following data can be collected:

(using on screen keyboard or other input method)

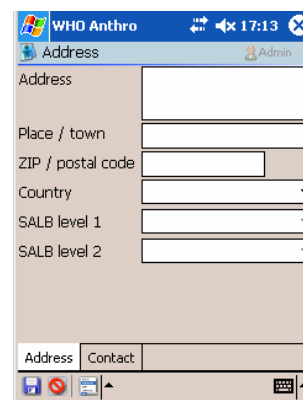
- Place/town
- ZIP/postal code (maximum 7 characters)

In the <Contact> tab section the user can add:

- Phone number (maximum 15 characters)
- E-mail



*District, Province, State, Country, SALB Level 1 and Level 2* are selected based on predefined lists.

The use of the address and SALB lists can be disabled in *Settings* see section 4.4.



Child address window

## 8.5 Online help

Contextual online help pages provide instantaneous, concise guidance on main window functions. To open a help page, tap on pull-up arrow (▲) next to the toolbar icon  and select *Online help*. To close the help window, tap on . These online help pages are only available in English.

## 8.6 About


The *About* window presents the main objective of this software, contact details for the WHO Anthro software team, and the web site address for further information.





## 8.7 Error log and error reporting

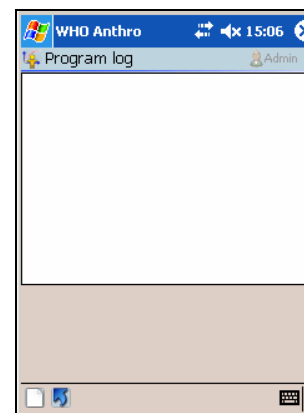
The error log contains information on any system error that occurred, e.g. when user tries to import address file with incompatible format, then this error is logged on that file.

This log file plays an important role in locating and correcting potential problems. When users report problems it should thus always be submitted together with the bug report.

To view the Program log window, open the tool-bar pull up menu  and select *View log*.

To close the window, tap .

The user has the option to reset the program log and delete existing error logs by tapping . The applications automatically cleans up entries that are older than 2 months.



The DB and log folders can be modified in the application's setting screen, however the application will refuse to change either folder to a path where a DB file (*WHOAnthroll.sdf*), respectively a log file (*Log.xml*), already exists. This is by design: when modifying the DB or log folder, the application moves the DB or log file to the new folder; if a file of the same name already exists in the new folder, the app will refuse to overwrite it.

Even though exhaustive testing was performed to ensure that this software works properly, virtually all software programs have "bugs". It would thus be appreciated if users could report encountered problems (random or systematic) when using WHO Anthro.

Identified bugs will be aggregated and posted on the web site [www.who.in/childgrowth/software/](http://www.who.in/childgrowth/software/). We therefore recommend always to check this list before reporting a problem. Should the same problem already appear in the list, there will be no need to send another report. However, if the problem is not yet listed then please send a bug-report describing in detail:

- The problem found
- Whether the problem appeared systematically or randomly
- Where exactly and in what module interface it occurred
- How it occurred, including what sequence of commands and/or buttons led to it
- What the expected result would have been
- If you managed to circumvent/solve the problem, how you did this
- Attach the error log, see section 8.2 for info about copying files.
- Please send the bug-report to the following address:

WHO Anthro  
Department of Nutrition  
World Health Organization  
Avenue Appia 20  
1211 Geneva 27  
Switzerland

fax: +44 22 791 4156

[who\\_anthro@who.int](mailto:who_anthro@who.int)

Please note this is not a helpline address.



## 9. Step by step examples

This section includes step by step examples for using the different modules and key functionalities.

### 9.1 Individual assessment module

Given that the *Anthropometric calculator* is a simple version of the *Individual assessment* module, the example starts immediately with the later.

#### 9.1.1 Anthropometric measurements

##### 9.1.1.1 Child information

Tap on and enter the following data in the *Child info* window

- First name James
- Family name Ndugulie
- Sex Male
- Date of birth 9 May 2003

Optional: To enter parental data, address, follow-up information or notes, tap on respective section buttons at the bottom.

- Tap on to save.

ID	Name	Date of birth	Sex
1	Kwanza, Kofi	09/05/00	Male
2	Lopez, Flora	19/11/01	Female
3	Smith, Jane	14/02/05	Female
7	Ndugulie, James	09/05/03	Male

New child

List of children

##### 9.1.1.2 Visit 1

Select James Ndugulie and tap on .

Tap on to open list of visits. As this is a new child no visits exists.

Tap on to add a visit and enter the following data:


- Date of visit 12 Oct. 2003
- Oedema No
- Weight 4.8 kg
- Length 59.8 cm
- Measured Recumbent
- HC 41 cm
- MUAC 12.3 cm
- TSF 6.7 mm
- SSF 6.6 mm


New visit


Indicator	z-score	Percentile	Flag
Weight-for-length	-2.64	0.4	
Weight-for-age	-3.90	NA	
Length-for-age	-2.99	0.1	
BMI-for-age	-3.11	NA	
HC-for-age	-1.37	8.5	
MUAC-for-age	-1.75	4.0	
TSF-for-age	-1.88	3.0	
SSF-for-age	-0.60	27.5	


Valid z-scores were derived for all indicators.



Results window

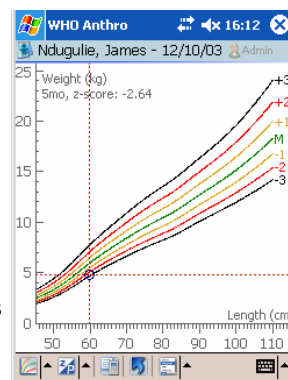
Tapping on  opens the *Results* window for this visit showing the z-scores and percentiles for each anthropometric indicator.

Tap on  to open the *Graph* window for this visit.

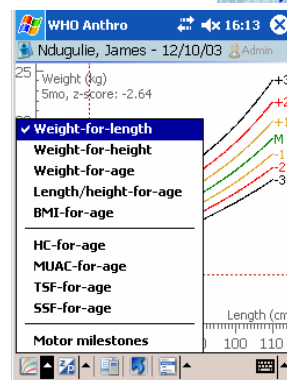
Open pull-up menu next to  to select other graphs.

To change from z-scores (default) to percentiles tap on  and select accordingly.

Tap on  and then  to save and close the visit.




Graph: Weight-for-length



Select other graphs

### 9.1.1.3 Visits 2 - 8

In the list of *Visits* window tap on  to add new visits and enter the visit-specific data shown in the table below. Follow the same steps as for the first visit. The final list of *Visits* window should look like the image to the right.


Date of visit	Oedema	Weight	Length / height	Measured	MUAC
12 December 2003	Yes	5.5	61.2	Recumbent	11.0
15 March 2004	No	7.1	65.4	Recumbent	12.0
26 July 2004	No	7.9	70.5	Recumbent	12.2
26 December 2004	No	8.6	75.1	Recumbent	13.0
29 May 2005	No	9.8	81.2	Standing	13.5
31 December 2005	No	11.2	89.9	Standing	14.0
26 October 2006	No	13.9	95.2	Standing	15.0

List of visits

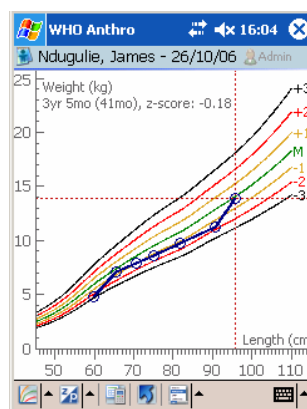
### 9.1.1.4 Graphic display of visits

Once all the visits are added select last visit and tap first on  and then .

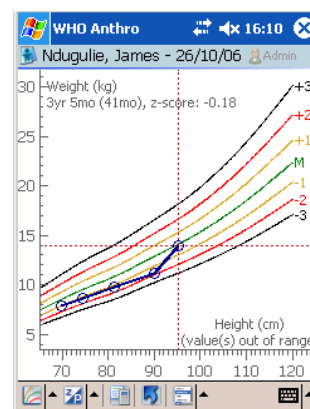
The first graph shows weight-for-length. The visit point when James was classified has having oedema is missing, given that the weight data is discarded. The visit is also missing from the weight-for-height, weight-for-age and BMI-for-age curves.

Open the pull-up menu next to  and select weight-for-height. Given that the first two visits present length measurements that converted to height are less than 65 cm, the weight-for-height graph is missing these 2 measurement points.

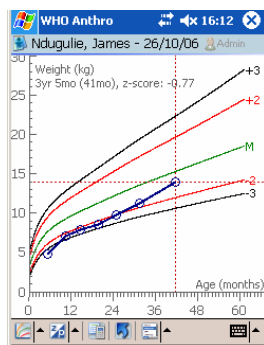
Length/height-for-age and MUAC-for-age show all 8 visits.



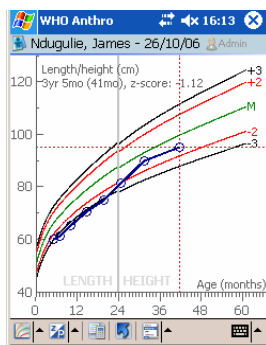
Weight-for-length



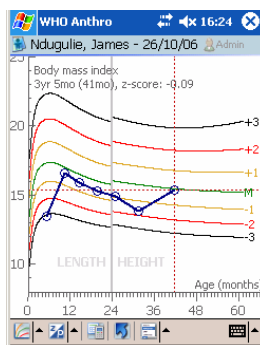
Weight-for-height



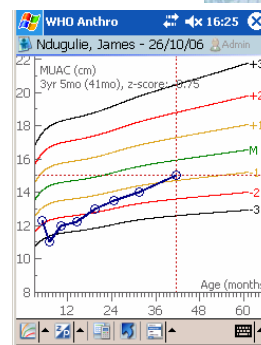
Weight-for-age



Length/height-for-age



BMI-for-age

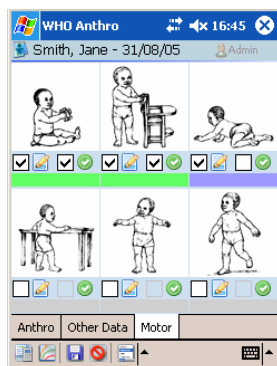


MUAC-for-age

## 9.1.2 Motor development

### 9.1.2.1 Motor milestones assessment: Jane Smith

To illustrate the MM assessment, open the example child Jane Smith. Tap on to open list of visits, select the first visit and tap on . Then go to the tab section <Motor> and the overview window will pop open showing the images of the 6 gross motor milestones. Their sequence is from left to right.

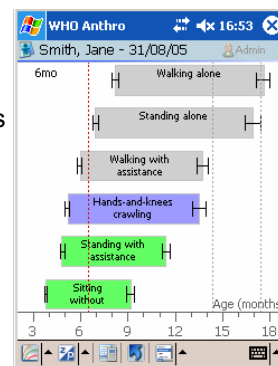


MM overview, visit 1

At visit 1, Jane was assessed for the first 3 MMs: Sitting alone, Standing with assistance and hands and knees crawling. The observer confirmed that she fulfilled all criteria for MM1 and MM2; but she could not perform all criteria of MM3.

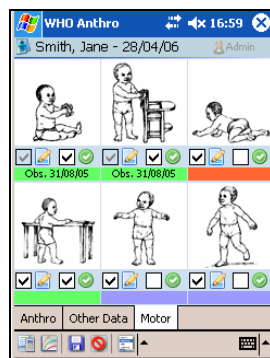
Tap on to see image on the right.

The currently open visit is marked by the red dotted line.

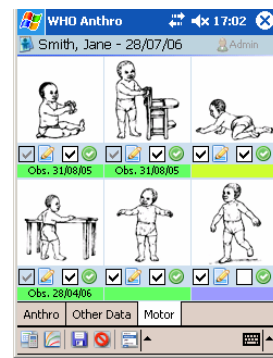


Windows of achievement graph

Open visit 2: Jane was assessed for MMs 3-6. She could not do MM 3 and age was beyond the upper limit for the respective window of achievement thus the colour red, she performed all criteria of MM 4 but not 5 or 6.



MM overview, visit 2



MM overview, visit 3

Open visit 3: Jane was assessed for MM 3, 5 and 6. She was able to perform all criteria for MM 3 and 5 but not 6. As achievement of MM 3 was late the colour is lime green and because her age is below the upper limit of the window for MM 6, the colour is blue.


To enter visit 4, tap on to go back to the list of visits window for Jane Smith.

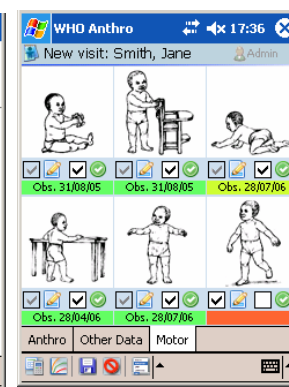
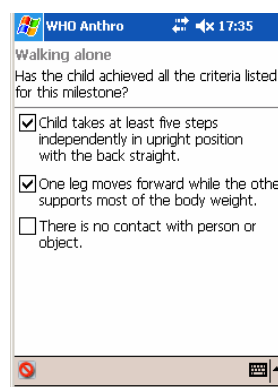
Tap on to add a new visit. Enter as visit date 22 January 2007. Jane was then 1year and 11 months, still eligible for motor development assessment.

Go directly to the MM assessment and tap on the <Motor> button to open the overview window.





Tick ☒ for MM 6, the colour will change to red. Then tick ☐ to open the page with all the criteria. In this occasion the observer can tick two criteria but not the third (see image to the right). Tap on  to close the window. The overview appears as shown on far right.



The situation is such that the observer now doubts whether the assessment of MM 5 was true and decides to reset this MM.

### 9.1.2.2 Resetting a motor milestone

Given that the child is being assessed over time at several visits, assessment errors may be detected. The software allows the user to reset an assessed and observed milestone immediately or retrospectively:


At a current visit, the user may click on all criteria as met, confirm the achievement of the motor milestone, but then decide that this is not correct and wish to alter this information.

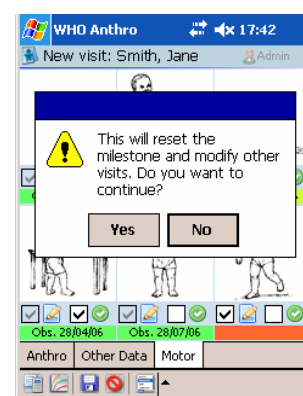
If a milestone was observed at a previous visit and saved as achieved, but at present the child demonstrates a questionable state of attainment, the reset action affects the current visit entry and backwards to the visit of the milestone's first observed achievement.

To reset a MM un-tick ☐. A pop-up window will request the user to confirm the reset.

Tap <Yes> to reset the milestone to un-assessed and un-achieved. The colour code will revert to grey on the overview and MM graph.

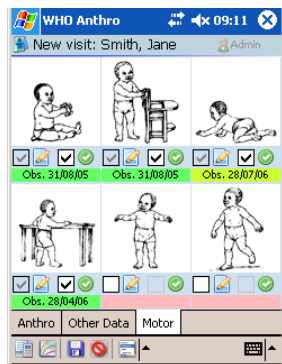
Tapping on <No> will return the user to the particular milestone window without resetting.

Assess MM 5 and tick the first criteria and then tap on  as Jane cannot perform the other criteria. The colour code for MM 5 changes to red.

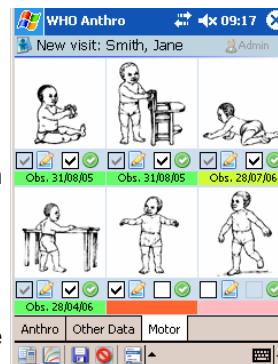


Confirm reset

Given the questionable MM achievement status, Jane is seen again the following month on 11 February 2007, just before her birthday.



MM 5 and 6 appear now rose as they were formerly red, have been reset, and are now un-assessed. Now assess MM 5. When ☒ is ticked the colour code will change to red. Tick ☐ to open the page and confirm all criteria. Do the same for MM 6.






Jane has now achieved all 6 MMs. She was somewhat late for MM 3, 5 and 6, as indicated by the lime green colour code.

### 9.1.2.3 Motor milestone assessment for a new child

To enter a new child, open the *Individual assessment* module.

#### Child information

Tap on  and enter the following into the *Child* window:

- First name Liz
- Last name Kwanza
- Sex Female
- Date of birth 2 March 2006

Tap on  and then  to add a new visit





#### Visit 1

In the Anthro window enter:

- Date of visit 31 August 2006, the child is 5 months old

This example focuses entirely on motor milestones and no other data are entered.

Tap on *<Motor>* to open the *Motor milestones* window for this visit.

Tick  for MM 1, the colour code will turn blue. Then tick  to open the page with all the criteria. Liz can perform all and the moment all criteria are confirmed the overview pops up and MM1 is coded green. To reset, un-tick  and , the MM1 will return to grey, meaning un-assessed.

Re-assess and confirm to obtain same image as before.

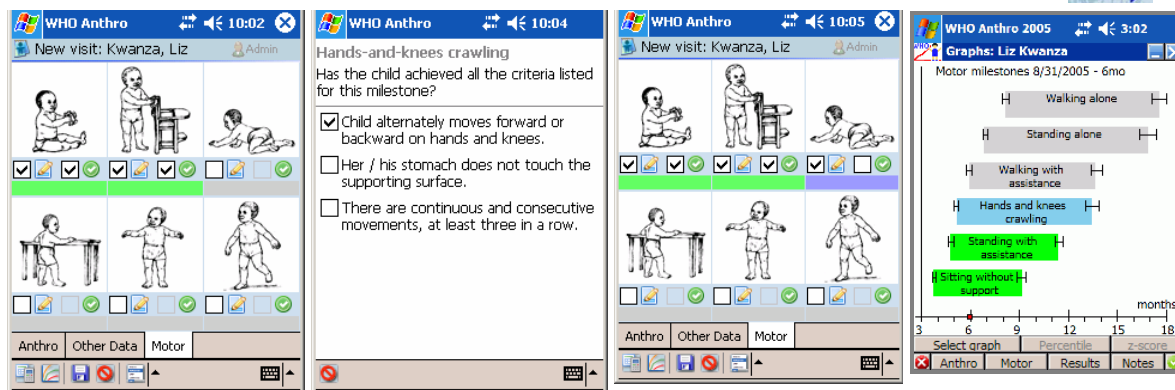
The user can proceed to assess the other milestones according to the images below.

The child also met all the achievement criteria for MM 2, *Standing with assistance*, but only one criterion for MM 3, *Hands-and-knees crawling*. If some criteria are un-fulfilled the software discards this information once the window is closed and only retains that the milestone was assessed. At present, the child is too young to be assessed for the remaining milestones.

Tap on  to view the windows of achievement graph.

The colour scheme reflects that milestones *Walking with assistance*, *Standing alone* and *Walking alone* were not assessed (grey); milestone *Hands-and-knees crawling* was assessed but has not been achieved and the age of the child lies below or inside the window (blue); and, milestones *Standing with assistance* and *Sitting without support* are achieved within the designated windows of achievement (green).





Tap on to go back.

Tap on to save which opens the list of visits window.

Tap on to add another visit.

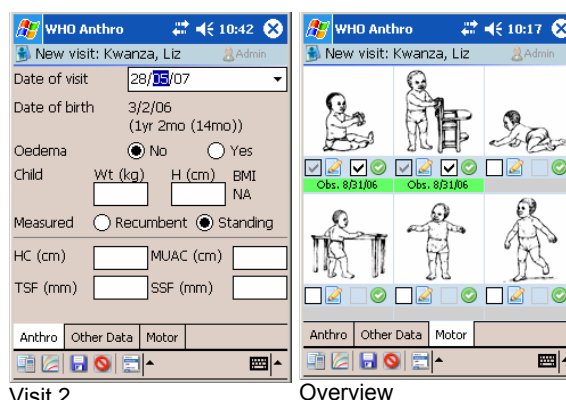
## Visit 2

At the second visit, 28 April 2007, the child is now 14 months old.

Open the <Motor> section to enter the new assessment.

The overview shows the previous assessment status. The achieved MMs contain the date when they were observed. An observed and achieved milestone does not need to be re-assessed.

The assessment can start with MM 3.

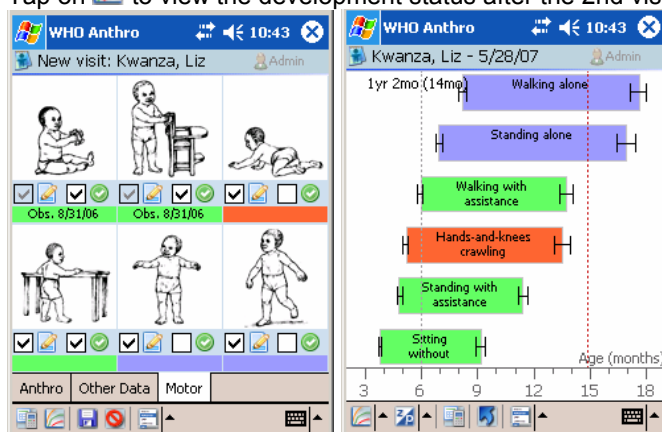


Visit 2

Overview

In visit 2 the child was assessed for all remaining milestones and she met two criteria required for milestones *Hands-and-knees crawling*, all criteria of milestone *Walking with assistance*, two criteria for *Standing alone*, one of the three criteria for milestone *Walking alone*.

Tap on to view the development status after the 2nd visit.



Overview and graph indicate that the child achieved milestone *Walking with assistance*, but not *Standing alone* or *Walking alone* (which is normal at her age) — yet she is still not able to perform *Hands-and-knees crawling*. Since her age is above the upper limit expected for *Hands-and-knees crawling*, the window is coloured red. The other two unachieved milestones are coloured blue because the child's age is below the upper age boundary.



Note: About 4.3% of the children in the WHO Multicentre Growth Reference Study were never observed to crawl on hands and knees. Other studies also report that this milestone is sometimes not performed and that instead some other type of locomotion is used, such as bottom shuffling or crawling on the belly (WHO Multicentre Growth Reference Study Group, 2006).

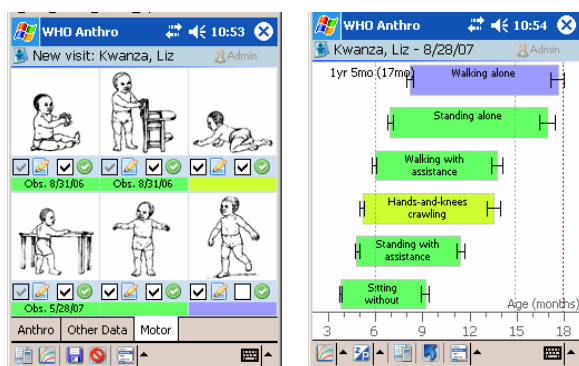
Tap on and .

### Visit 3

Tap on and enter the child's third date of visit, 28 July 2007. She is now 17 months old

Tap on <Motor>. There remain MM 3, 5 and 6 to be assessed.

The child can now successfully crawl on hands-and-knees (lime-coloured to indicate that the achievement age was beyond the band's upper limit) and stand alone, but not yet walk alone according to the set criteria. After entering this information the following overview should appear:



Tap on to save the last visit.

To save all three visits' data return to the child window: tap on and then . This will return you to the list of children.

To exit the module at this point open pull-up menu next to and select *Back to start*.

### 9.1.3 Define additional data

The following example shows how to define and then collect additional data about the body temperature of the child, when fever started and other symptoms.

- To open *List of children* window, tap on the shortcut within the *Individual assessment* button
- Open pull-up menu next to and select *Manage additional data*

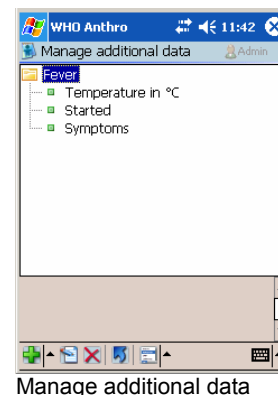
A blank *Manage* window will appear.

To add a new section, tap pull-up menu next to and select *New section* and enter [Fever] into the ID field and tap on .

Add a new variable within that section. Tap pull-up menu next to and select *New variable* in current section. Type [Temperature in °C] in the variable field and select *Numeric* in the *Value type* field. Specify minimum value = [36] and maximum value = [43] and tap on .

Add two more variables in the same section:

- [Started]; *Value type*: Date
- [Symptoms]; *Value type*: Text



Note: If there are several sections, make sure to select the right section before adding a new variable.



Tap on to return to the *List of children* window.

### 9.1.4 Collect additional data

Once the additional data have been defined it is now possible to collect these data for new visits in existing children or in any new child added.

- In the *List of children* window select a child and tap on
- Tap on to open list of visits
- Tap on to add a new visit
- Open tab section <Other data>, below the *Notes* field appear the newly created variables
- Tapping on the field behind *Temperature in °C* opens the numeric pad; key in [39.5]
- The date is by default set to current date and can be changed using the keyboard or the calendar.
- A tap on the field behind *Symptoms* opens the keyboard; key in [Cough and abdominal pain]
- Tap on to save

## 9.2 Nutritional survey

### 9.2.1 Anthropometric and motor milestones assessment

On the main window go to the *Nutritional survey* button and tap on to add a new survey.

Fill in the following information in the *Survey properties* window:

- *Name*: Example survey
- *Notes*: Step by step example
- Leave ID assignment as automatic for record and Household (default setting)
- Tap on *Manage additional data* to define sections and variables following instructions in section 9.1.3.
- Create a new section [*Food aid*] with the following variables and value types (see images below):

- Tap on , , and to open list of child records



- Tap on to add a new child record
- In the *New record* window the *ID* and *Household* fields will appear grey and no data can be entered. An automatic ID number will be attributed to every saved child, starting with "1".
- Tap on , and again to return to the list of surveys.

Add another survey this time with manual ID assignment.

Tap on and fill in the following information in the *Survey* properties window:

- *Name*: Example manual ID
- *Notes*: Step by step example
- Change Record ID assignment to manual
- Tap on to open list of child records
- Tap on to add a child and fill in the *New record* window with manual ID [101].

The completion of Anthro window is similar to the *IA* module, with the only difference that sex has to be specified on top of this page.

Complete DoB as 23 December 2005.

The tab section *Other Data* contains by default a *Notes* field. The lower part of the window appears as pre-defined in *New survey* window under *Manage additional data*.

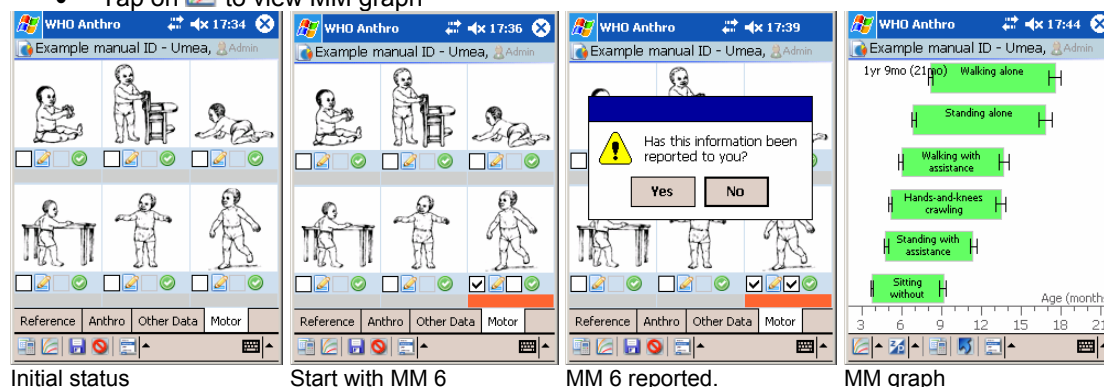
The Results and Graphs windows are similar to the ones in *Individual assessment* module.

Given that there is only one visit, the <Motor> assessment in the Nutritional survey module accepts achievement status data based on recorded information by the parents/caregiver.



When opening <Motor> the *MM overview* window pops up with all MM colour codes grey, meaning un-assessed.



Following the recommendation for MM data collection in NS, assess the child first for MM 6, *Walking alone*.

- Tick for MM 6, the colour code changes to red. Then tick to open criteria page. Tina is not willing to walk but the mother confirms that the child is able to walk alone. Tick all criteria. Select <Yes> to the question: "Has this information been reported to you?" All 6 MMs will thus be coded as assessed and reported as achieved.
- Tap on to view MM graph






Tap on  and  to return to list of records.

Tap on  and  to return to list of surveys.



## 9.2.2 Archive and export NS data

From the list of surveys the user can archive and export one or all surveys.


To archive:

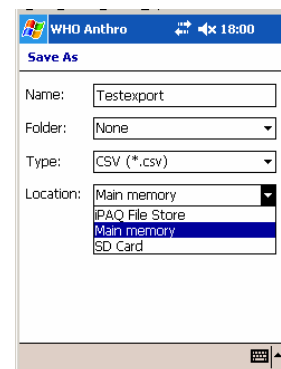
- Tap on respective row to select a survey
- Open pull-up menu next to  and select *Archive selected*

To retrieve a survey from archive:

- Go to *View archive*, select survey and then tap on . The survey's name will disappear from this list. Tap on  to return to list of active surveys which contains the retrieved survey.

To export:

- Tap on respective row to select a survey
- Open pull-up menu next to  and select *Export to file*
- Answer <No> in pop-up message window to export only selected surveys.
- In *Save as* window key in Name [Testexport]
- Leave default folder [None]
- Select *Type* [CSV (\*.csv)]
- Select Location to read [Main memory]
- Tap on <OK> to confirm
- Answer <No> to pop-up message to not include anthropometric results.
- The wait cursor will run during the export process
- When export is done the cursor disappears



For instructions on how to copy this file to the desktop please see section 8.2.



## 10. Troubleshooting

- On older Windows Mobile 2003 devices, the 'date' controls use only 2 digits (e.g. '03' instead of '2003') when editing the year part of the date, which can make manual typing troublesome. It is recommended to use the calendar instead.
- On some devices, the SIP (software input panel, or virtual keyboard) icon at the right end of the toolbar sometimes disappears after a message box is shown (this is a .NET framework bug). Workaround: either change screen (e.g. show 'about' screen) or tap on a text box (to popup the input panel) to make the icon re-appear.

Systems which are incompatible with WHO Anthro are:

- PALM OS
- Nokia
- Linux
- Blackberry

After using a file dialog for browsing for a file in Anthro (e.g. for import or export), you may notice that the folder containing the selected file, as well as its parent folders, are "locked"; this means that you cannot move, rename or delete them. This is due to the fact that Windows keeps a reference to the folder, so that it can maintain it for the next time the file dialog is used. If you want to move, rename or delete the folder or one of its parent folders, you must either open or save a file located in another folder (from the same Anthro module), or exit Anthro.



## 11. References

de Onis M, Garza C, Victora CG, Bhan MK, Norum KR, editors. The WHO Multicentre Growth Reference Study (MGRS): Rationale, planning, and implementation. Food and Nutrition Bulletin 2004;25(Supplement 1):S3-S89.

de Onis M, Onyango AW, Van den Broeck J, Chumlea WC, Martorell R. Measurement and standardization protocols for anthropometry used in the construction of a new international growth reference. Food and Nutrition Bulletin 2004;25(Supplement 1):S27-36.

de Onis M, Garza C, Onyango AW, Martorell R, editors. WHO Child Growth Standards. Acta Paediatrica 2006;95(Supplement 450):S1-S101.

FAO. Conducting small-scale nutrition surveys: A field manual. Nutrition planning, assessment and evaluation service. Nutrition in Agriculture No. 5. Rome, Italy: Food and Agricultural Organization, 1990.

Fox J and Long JS editors. Describing univariate distributions. In: Modern Methods of Data Analysis, pp. 58-125. Newbury Park, CA: Sage Publications, 1990.

WHO Working Group on Infant Growth. An evaluation of infant growth. WHO/NUT/94.8. Geneva, Switzerland: World Health Organization, 1994.

WHO. Physical status: the use and interpretation of anthropometry. Expert Committee Report. WHO Technical Report Series No. 854. Geneva: World Health Organization, 1995 ([http://whqlibdoc.who.int/trs/WHO\\_TRS\\_854.pdf](http://whqlibdoc.who.int/trs/WHO_TRS_854.pdf)).

WHO. Diet, nutrition and the prevention of chronic diseases. Report of a joint WHO/FAO Expert Consultation. Technical Report Series No. 916. Geneva: World Health Organization, 2003 ([http://whqlibdoc.who.int/trs/WHO\\_TRS\\_916.pdf](http://whqlibdoc.who.int/trs/WHO_TRS_916.pdf)).

WHO Child Growth Standards: length /height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age. Methods and development. Geneva, Switzerland: World Health Organization, 2006.

WHO Child Growth Standards: Head circumference-for-age, arm circumference-for-age, triceps skinfold-for-age and subscapular skinfold-for-age. Methods and development. Geneva, Switzerland: World Health Organization, 2007.

WHO Multicentre Growth Reference Study Group. WHO Motor Development Study: Windows of achievement for six gross motor development milestones. Acta Paediatr Suppl 2006;450:87-96.

Wijnhoven TMA, de Onis M, Onyango AW et al. Assessment of gross motor development in the WHO Multicentre Growth Reference Study. Food and Nutrition Bulletin 2004;S37-S44.



## Annex 1

In the *Individual assessment (IA)* module the definitions of all the variables found in an exported file (\*.txt, and \*.csv) are:

Columns in txt and csv	Comment
DisplayID	Integer number, max 2,147,483,647
FirstName	First name of the child (max 50 characters)
LastName	Family name of the child (max 50 characters)
DateOfBirth	Default format dd-MM-yyyy HH:mm:ss. If DoB is unknown this field is blank.
DateOfBirthIsApprox	Default = 0, i.e. complete DoB; if day of birth was approximated = 1
Sex	0 = female, 1 = male; this is an obligatory data-entry field
ChildNotes	These are the notes from child window, which are available at each visit and carried over in the export for every visit row
FollowUpDate	Mutually exclusive with the other Follow up fields
FollowUpInterval	Mutually exclusive with the other Follow up fields
FollowUpRefTo	Mutually exclusive with the other Follow up fields
ChildCreatedBy	User
MotherFirstName	(max 50 characters)
MotherLastName	(max 50 characters)
MotherHeight	Unit: cm, with max 2 decimal points
MotherWeight	Unit: kg, with max 2 decimal points
MotherDateOfBirth	Default format dd-MM-yyyy HH:mm:ss
MotherDateOfBirthIsApprox	Default = 0
MotherNotes	(max 250 characters)
MotherCreatedBy	User
FatherFirstName	(max 50 characters)
FatherLastName	(max 50 characters)
FatherHeight	Unit: cm, with max 2 decimal points
FatherWeight	Unit: kg, with max 2 decimal points
FatherDateOfBirth	Default format dd-MM-yyyy HH:mm:ss
FatherDateOfBirthIsApprox	Default = 0
FatherNotes	(max 250 characters)
FatherCreatedBy	User
AddressStreetInfo	(max 50 characters)
AddressPlace	(max 50 characters)
AddressZIP	(max 50 characters)
AddressDistrict	(max 50 characters)
AddressProvince	(max 50 characters)
AddressState	(max 50 characters)
AddressCountry	(max 50 characters)
AddressSALBLevel1	(max 50 characters)
AddressSALBLevel2	(max 50 characters)
AddressPhoneNumber	(max 20 characters)
AddressEmail	(max 50 characters)
AddressCreatedBy	User
Date	Date of visit, default format dd-MM-yyyy HH:mm:ss
Weight	Unit: kg, with max 2 decimal points
Height	Unit: cm, with max 2 decimal points
IsRecumbent	0=no, 1=yes, default = 0; this is an obligatory data-entry field
HasOedema	0=no, 1=yes, default = 0; this is an obligatory data-entry field
HC	Unit: cm, with max 2 decimal points
MUAC	Unit: cm, with max 2 decimal points
TSF	Unit: mm, with max 2 decimal points





Columns in txt and csv	Comment
SSF	Unit: mm, with max 2 decimal points
MM1Ass	MM 1 assessed: 0=no, 1=yes
MM1Obs	MM 1 all criteria observed: 0=no, 1=yes
MM2Ass	MM 2 assessed: 0=no, 1=yes
MM2Obs	MM 2 all criteria observed: 0=no, 1=yes
MM3Ass	MM 3 assessed: 0=no, 1=yes
MM3Obs	MM 3 all criteria observed: 0=no, 1=yes
MM4Ass	MM 4 assessed: 0=no, 1=yes
MM4Obs	MM 4 all criteria observed: 0=no, 1=yes
MM5Ass	MM 5 assessed: 0=no, 1=yes
MM5Obs	MM 5 all criteria observed: 0=no, 1=yes
MM6Ass	MM 6 assessed: 0=no, 1=yes
MM6Obs	MM 6 all criteria observed: 0=no, 1=yes
Notes	Child's notes
AdditionalData	Stored as xml (unlimited column size)
CreatedBy	User
WHZ	Derived weight-for-height z-score, rounded to 2 decimal points
HAZ	Derived height-for-age z-score, rounded to 2 decimal points
WAZ	Derived weight-for-age z-score, rounded to 2 decimal points
BAZ	Derived BMI-for-age z-score, rounded to 2 decimal points
HCZ	Derived head circumference-for-age z-score, rounded to 2 decimal points
MUAZ	Derived MUAC-for-age z-score, rounded to 2 decimal points
TSFZ	Derived triceps skinfold-for-age z-score, rounded to 2 decimal points
SSFZ	Derived subscapular skinfold-for-age z-score, rounded to 2 decimal points
BMI	Derived BMI, rounded to 1 decimal point

The xml format has no columns and the data are presented as in the following example (note that field values are empty for easy readability purposes).

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<Children>
  <Child DisplayID="" FirstName="" LastName="" DateOfBirth="" DateOfBirthIsApprox=""
Sex="" FollowUpDate="" FollowUpInterval="" FollowUpRefTo="" Notes="" CreatedBy="" >
    <Mother FirstName="" LastName="" Height="" Weight="" DateOfBirth=""
DateOfBirthIsApprox="" Notes="" CreatedBy="" />
    <Father FirstName="" LastName="" Height="" Weight="" DateOfBirth=""
DateOfBirthIsApprox="" Notes="" CreatedBy="" />
    <Address StreetInfo="" Place="" ZIP="" District="" Province="" State=""
Country="" SALBLevel1="" SALBLevel2="" PhoneNumber="" Email="" CreatedBy="" />
    <Visits>
      <Visit Date="" Weight="" Height="" IsRecumbent="" HasOedema="" HC="" MUAC=""
TSF="" SSF="" MM1Ass="" MM1Obs="" MM2Ass="" MM2Obs="" MM3Ass="" MM3Obs="" MM4Ass=""
MM4Obs="" MM5Ass="" MM5Obs="" MM6Ass="" MM6Obs="" Notes="" AdditionalData=""
CreatedBy="" WHZ="" HAZ="" WAZ="" BAZ="" HCZ="" MUACZ="" TSFZ="" SSFZ="" BMI="" />
    </Visit .../>
  </Visits>
</Child>
<Child ...>...</Child>
</Children>
```



In the *Nutritional survey (NS)* module the definitions of all the variables found in an exported file (\*.txt, and \*.csv) are:

Columns in txt and csv	Comment
SurveyName	(max 50 characters)
SurveyNotes	(max 250 characters)
AdditionalDataDef	Additional data variables as defined by user (no maximum of letters defined)
SurveyOptions	Shows the lower and upper flag boundaries for each indicator MinZBounds">-5 -6 -6 -5 -5 -5 -5 </O><O "MaxZBounds">5 5 6 5 5 5 5 </O></Opt
SurveyCreatedBy	User
Date	Default format dd-MM-yyyy HH:mm:ss
Cluster	Non obligatory field; either Auto or Manual data-entry depending on selection of ID assignment
Team	Non obligatory field; either Auto or Manual data-entry depending on selection of ID assignment
DisplayID	Non obligatory field; either Auto or Manual data-entry depending on selection of ID assignment
Household	Non obligatory field; either Auto or Manual data-entry depending on selection of ID assignment
WeightingFactor	Any value between 0 and 100'000 is accepted (up to 16 decimals)
FirstName	First name of the child (max 50 characters)
LastName	Family name of the child (max 50 characters)
DateOfBirth	Default format dd-MM-yyyy HH:mm:ss
DateOfBirthIsApprox	Default = 0, i.e. complete DoB; if day of birth was approximated = 1
Age	In days
Sex	0 = female, 1 = male; this is an obligatory data-entry field
Weight	Unit: kg, with max 2 decimal points
Height	Unit: cm, with max 2 decimal points
IsRecumbent	0=no, 1=yes, default = 0; this is an obligatory data-entry field
HasOedema	0=no, 1=yes, default = 0; this is an obligatory data-entry field
HC	Unit: cm, with max 2 decimal points
MUAC	Unit: cm, with max 2 decimal points
TSF	Unit: mm, with max 2 decimal points
SSF	Unit: mm, with max 2 decimal points
MM1Ass	MM 1 assessed: 0=no, 1=yes
MM1Obs	MM 1 all criteria observed: 0=no, 1=yes
MM1Rep	MM 1 all criteria reported as observed: 0=no, 1=yes
MM2Ass	MM 2 assessed: 0=no, 1=yes
MM2Obs	MM 2 all criteria observed: 0=no, 1=yes
MM2Rep	MM 2 all criteria reported as observed: 0=no, 1=yes
MM3Ass	MM 3 assessed: 0=no, 1=yes
MM3Obs	MM 3 all criteria observed: 0=no, 1=yes
MM3Rep	MM 3 all criteria reported as observed: 0=no, 1=yes
MM4Ass	MM 4 assessed: 0=no, 1=yes
MM4Obs	MM 4 all criteria observed: 0=no, 1=yes
MM4Rep	MM 4 all criteria reported as observed: 0=no, 1=yes
MM5Ass	MM 5 assessed: 0=no, 1=yes
MM5Obs	MM 5 all criteria observed: 0=no, 1=yes
MM5Rep	MM 5 all criteria reported as observed: 0=no, 1=yes
MM6Ass	Motor milestone 6 assessed: 0=no, 1=yes
MM6Obs	MM 6 all criteria observed: 0=no, 1=yes
MM6Rep	MM 6 all criteria reported as observed: 0=no, 1=yes
Notes	Child's notes
AdditionalData	Stored as xml (unlimited column size)



Columns in txt and csv	Comment
CreatedBy	User
WHZ	Derived weight-for-height z-score, rounded to 2 decimal points
HAZ	Derived height-for-age z-score, rounded to 2 decimal points
WAZ	Derived weight-for-age z-score, rounded to 2 decimal points
BAZ	Derived BMI-for-age z-score, rounded to 2 decimal points
HCZ	Derived head circumference-for-age z-score, rounded to 2 decimal points
MUACZ	Derived MUAC-for-age z-score, rounded to 2 decimal points
TSFZ	Derived triceps skinfold-for-age z-score, rounded to 2 decimal points
SSFZ	Derived subscapular skinfold-for-age z-score, rounded to 2 decimal points
BMI	Derived BMI, rounded to 1 decimal point

The corresponding xml format is as follows (for easy reading the field values are empty):

```
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<Surveys>
  <Survey Name="" Notes="" AdditionalDataDef="" Options="" CreatedBy="">
    <Records>
      <Record Date="" Cluster="" Team="" DisplayID="" Household=""
WeightingFactor="" FirstName="" LastName="" DateOfBirth="" DateOfBirthIsApprox=""
Age="" Sex="" Weight="" Height="" IsRecumbent="" HasOedema="" HC="" MUAC="" TSF=""
SSF="" MM1Ass="" MM1Obs="" MM1Rep="" MM2Ass="" MM2Obs="" MM2Rep="" MM3Ass=""
MM3Obs="" MM3Rep="" MM4Ass="" MM4Obs="" MM4Rep="" MM5Ass="" MM5Obs="" MM5Rep=""
MM6Ass="" MM6Obs="" MM6Rep="" Notes="" AdditionalData="" CreatedBy="" WHZ="" HAZ=""
WAZ="" BAZ="" HCZ="" MUACZ="" TSFZ="" SSFZ="" BMI="" />
      <Record .../>
    </Records>
  </Survey>
  <Survey ...>...</Survey>
</Surveys>
```